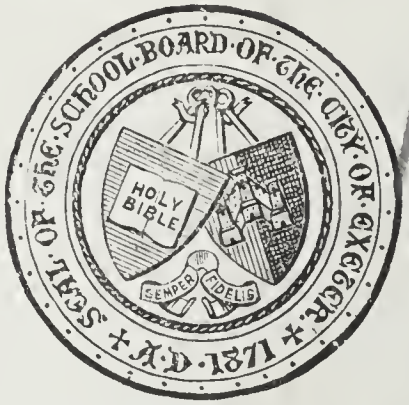
SHORT

CHAPTERS ON NATURAL HISTORY

S. Mary Arches' St. Infants' School



DECEMBER, 1878.

Presented to

Fredk Lethbridge

As a Reward for Early and

Punctual Attendance

DURING THE YEAR, 1878.

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SHORT CHAPTERS

ON

NATURAL HISTORY.

PUBLISHED UNDER THE DIRECTION OF
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FOR THE SOCIETY FOR PROMOTING CHRISTIAN KNOWLEDGE.

CHAPTERS ON BIRDS.

An enemy in the nest.

THE CUCKOO.

THERE is no British bird with whose note we are so familiar as that of the cuckoo. I have met with many people who never heard the song of the nightingale, and who could not distinguish that of the robin or the wren, though these birds' names are household

words; but I never met with anybody, man, woman, or child, of any size, who did not know the note of our friend the cuckoo. His form and appearance are not so familiar. Many educated people don't know what he is like. He has often been mistaken for a hawk. His habit of making free with other birds' nests is generally known, and has brought him into very bad repute. But the fact is we know less about the cuckoo than we think. He is a shy, queer sort of fellow. Very few naturalists can boast of an intimate acquaintance with him. He is a remarkably reserved bird, and, like all reserved people, he may have been much misrepresented.

Lucky for him that he comes to us at a pleasant time of the year, and is a bearer of glad tidings, or we should not think so well of his monotonous song, nor be disposed to take a charitable view of his suspicious character. As it is, there is no bird that can reckon upon a warmer welcome to our shores than the cuckoo.

Now, what do we really know about our spring visitor? Did you ever meet with a boy who had found a cuckoo's nest? That would be an *un*-natural curiosity, wouldn't it?

People find "mares-nests" sometimes, but never cuckoos-nests. But there is nothing very strange in this. Other birds make no nests. Many are contented with a few twigs laid flat, and some lay their eggs on the bare ground. The strange thing about the cuckoo is, that it highly approves of nests, but it won't make one. It finds it much more convenient to use the nests of other birds, and always, you must observe, of smaller birds than itself. It is less trouble to get a neighbour to hatch one's eggs than to do it oneself, and so the female cuckoo gets a neighbour to do it. Now you may call this what you like, —laziness, cool impertinence, cowardice, bullying, tyranny; but I assure you it is considered perfectly right and proper in cuckoo society, and, if you could see it from a cuckoo point of view, you would at once acquit our friend of all blame.

But, seriously, this singular habit of the cuckoo is as much a law of nature as that habit, which most other birds have, of making nests for their eggs, and sitting upon them. The bird is in the plain path of duty, whatever we may think, and it is most interesting to observe how provision has been made

for its wants under the peculiar circumstances in which it is placed. We will speak first of its choice of nests in which to deposit its eggs. It has already been noticed that it invariably chooses the nest of a smaller bird. If it did not do this, the young cuckoo, when hatched, would most likely be ejected by the equally strong or stronger rightful occupants, instead of turning *them* out, as he is always able to do from his superior size. Moreover, the nest chosen is almost always that of an insect-feeding bird, like the cuckoo itself. If it were that of a grain-feeding bird, the young cuckoo, not being able to digest grain, would starve. The nests in which the egg or the young of the cuckoo has been most commonly found, are those of the hedge-sparrow, the pied-wagtail, the titlark, the white-throat, the redbreast, and the reed-warbler. These are all insect-feeders. It has also been found in the nest of the yellowhammer, the greenfinch, and the chaffinch, which are chiefly grain-feeders; but these also eat insects, and are known to feed their young commonly with caterpillars. The next instance of providential care we find in the fact that the cuckoo lays only one egg in each nest. It probably

lays three or four in the course of the season, as that number of eggs, in different stages of development, has been found, by dissection, in its ovary; but only one is deposited in a nest.

Instances are on record of two eggs having been found in a nest, but these were probably deposited by different cuckoos. In one of these instances the nest was watched, and, after hatching, a long contest took place between the two young ones for the sole possession, which terminated in the ejection of one of them. The reason of this is plain,—there would not be room for *two* such large birds as young cuckoos in one small nest. Frequently, to secure the whole nest for her offspring, the prudent mother turns out, or, if hungry, sucks the eggs she finds in it already; but, should she fail in this, from being disturbed in her work, or should other eggs be laid by the rightful owner afterwards, the young cuckoo, when hatched, easily gets rid of them.

But there is another wonderful circumstance about the cuckoo's egg. The cuckoo is a large bird, and its egg has to be deposited in a small nest, often with a very small opening

to it, in the hole of a wall or a bank. It would be impossible for the female cuckoo to do this, in the ordinary way, in some of the nests in which her egg has been found. The nest of the reed-warbler, for instance, suspended between reeds, would scarcely bear her weight; and there is more than one case of a *young* cuckoo having to be dug out of the hole of a wall, into which the *parent*, of course, could never have squeezed herself. Besides, the being obliged to sit on a nest for ten minutes or a quarter of an hour, which birds generally do before they lay an egg, would be very inconvenient to a bird which has to lay her egg by stealth, in the absence of the owner of the nest. How, then, is the egg placed in the nest? The cuckoo lays her egg on the ground; she then swallows it; carries it to the nest she has selected; disgorges it, and puts it in with her bill. This is most likely the way she manages. The process has never been actually seen; but Le Vaillant, a French naturalist, who died in 1824, twice shot the golden cuckoo, of the Cape of Good Hope, a bird with similar habits to our own, with its egg in its throat; and Professor Kinahan writes thus in the "Natural History

Review," vol. ii. p. 25:—"At Clondalkin (Ireland), on the 17th of June, 1848, I had, while in company with my friend, Dr. W. Haughton, the pleasure of having the truth of Le Vaillant's theory concerning the manner in which the cuckoo deposits its egg, entirely confirmed. My friend succeeded in winging a female cuckoo, as she was rising; she fell into a ditch, owing to the depth of which several minutes elapsed before we could get her out. Having obtained the bird, I proceeded to kill her by pressing on her breast, when I felt something slip from under my thumb, with a gurgling sound. Dr. Haughton, attracted by the sound, turned at the same moment, and we both saw an egg in the act of falling to the ground, from whence I picked it up perfectly uninjured." This was undoubtedly a cuckoo's egg, and both egg and skin are in the collection of the Dublin Natural History Society.

Some have conjectured, but without any positive proof, that the bird carries the egg in her bill, or in her talons: the shape of her foot, two toes before and two behind, would be very convenient for the latter plan. However, the egg is carried in some way or

other, and *placed* not *laid* in the nest. Of this there is very little doubt.

And the structure of the egg confirms this. Though a small egg, not larger than a hedge-sparrow's (singular for so large a bird), and thus admirably adapted to prevent the suspicions of the small bird in whose nest it is placed, the *shell* is much harder and thicker than other eggs of the same size, and therefore not in so much danger of breaking in the carriage. Any boy, who has ever blown a cuckoo's egg, will tell you this. It is much harder to bore than a blackbird's, which is nearly as big again. There is something also in the colour of the egg which is probably not without design. The most common colour is reddish-grey, shotted with dark-brown; but sometimes the ground colour is blueish-grey, and the spots vary considerably in shape and arrangement; in short, it is one of the most *variable* of our British eggs, and might easily be mistaken by a beginner for that of several birds.

I hope some of the juvenile readers of this paper will try next birds'-nesting season to find out something more about the cuckoo. It will be a grand thing if any of them should

see the bird actually deposit its egg. That boy will make a great discovery, for which he will deserve the thanks of every naturalist. But I hope they will not *shoot* the cuckoos, for they are useful birds, and do good service to farmers and gardeners. Their food consists almost entirely of insects, especially caterpillars, as has frequently been proved by examining the contents of their stomachs; and, having few household cares, they are able to devote more time to the conservation of our crops. If they sometimes help themselves to a gooseberry or a bunch of currants, the good work they do fully entitles them to it.

I trust that the above account may do something towards removing the popular prejudice against the cuckoo, on the ground of its being a cruel parent. I have seen it compared with the ostrich, which is represented in the Book of Job (xxxix. 16) as "hardened against her young ones as though they were not hers;" but the care the cuckoo takes to provide a comfortable nest, and a suitable nurse, for her young, may at any rate modify the harsh opinion that has been formed of her.

THE NIGHTINGALE.

"The liquid note beloved of men," which

> "Comes flying over many a windy wave
> To Britain, and in April, suddenly
> Breaks from a coppice gemm'd with green and red,"

is heard with delight by rich and poor in those favoured counties where this

unrivalled but capricious songster chooses to be heard. North of Yorkshire he is never met with, and nobody has ever heard his note in Cornwall, Wales, Ireland, or Scotland. The reason of this is not known. It can scarcely be the *cold* that keeps him from the North of England, because Swedish nightingales (the same species as ours) are famous; and his song cheers the exiles of Siberia. Nor can it be the *warmth* of Cornwall which deprives that county, and the greater part of Devonshire, of his presence, for he is a summer visitor in Italy and Greece, as here, and leaves those regions to spend the winter in Northern Africa, Egypt, and Syria. We find his name in the list of birds of the Holy Land, though not particularly mentioned in the Bible. He must therefore have been often heard by our blessed Saviour; and we can scarcely think that He, who stooped to admire the lilies of the field, would not be attracted and soothed by the sweet notes of the nightingale.

In all countries where he is known, and in all ages, the palm of song has been with one consent awarded him; and the highest compliment you can pay the best public singer is

that she sings like a nightingale. The superiority of its song to that of our other feathered friends consists, not only in its fulness and clearness, in the variety of its notes and the brilliancy of their execution, but, above all, in its *impassioned* expressiveness. It does not sing in the set form and with the humdrum monotony of most birds: it sings as if it had a *soul,* and as we listen to it our souls are similarly affected; now melted into sadness by that sweet melancholy *wail,* and presently again delighted by a tumultuous outbreak of joy.

No bird has ever been so much the theme of poets. Next to the moon, perhaps, and the rose, no natural object has had so many "lines," good, bad, and indifferent, addressed to it. Poets always make *him* feminine, out of compliment to the fair sex; but of course we all know that it is only the cock bird that sings. In poetry the nightingale is commonly called Philomela, or Philomel, the name of a Greek young lady, who is said to have been turned into a nightingale.

It is a common error, partly due to its name, and partly, perhaps, to the poets, that the nightingale only sings by night. The

fact is, that it sings quite as much by day, but at night, being almost the *only* singer, it is more noticed. It has one remarkable peculiarity whilst singing, which must often have been observed, and which attracted the attention of the author of the "Christian Year" (1st Sunday after Epiphany),—

> "Fearless of the passing hoof,
> Hardly will they fleet aloof."

The bird seems so entirely taken up with its own sweet tale of joy and sorrow, that you may frequently get close to the bush where it is, without disturbing it. Once, I remember, at night, being so near that I could distinctly see its little throat, as it sang on a bough above me, rising and falling against the sky. On another occasion—I am ashamed to say (my friends have often twitted me with this)—having gone to bed, over-tired and nervous, and not being able to sleep for a nightingale that was singing beautifully, close to my bedroom window, I got out of bed, and, finding no more convenient missile than a piece of soap, I shied it at Philomela, aiming at the point whence the noise seemed to come, but without in the least interrupting

its volubility; so that, having no more soap, I had no remedy but to go to bed again and bear it as well as I could.

As with the cuckoo, the nightingale is better known by its song than by its outward form. It is a very plain-coloured bird. All the upper parts, and the wings and tail, are of an uniform reddish-brown; the under parts, dull greyish-white. In size it is rather larger than a robin, but its shape is more slim and elegant. Like the robin, it makes its nest on the ground, and feeds on worms and insects. It lays four or five eggs of a dull drab colour. It is astonishing that so full a volume of sound should proceed from so *small* a bird. As the rustics in the "Deserted Village" wondered at their schoolmaster—

"That one small head should carry all he knew,"

so may we wonder that the little throat of the nightingale should contain a musical instrument of such power and compass as that with which it is furnished.

It is not surprising that we should try to make as much use of our talented visitor as we can, and this has been attempted in two

ways,—by extending the period of his song, and by widening the area of his visits. This we may call *nightingale-culture*. The first is done by the bird-catchers taking advantage of the fact that the male birds come over nearly a fortnight before the females. They catch them as soon as they arrive, when they are sure to be all males; and they find by experience that the birds then taken are easily tamed, but those taken after the pairing commences generally pine away and die. The usual singing-time, in a wild state, only lasts from about the middle of April to the beginning of June; but, by careful management and particular feeding, they may be kept in song for three months or more.

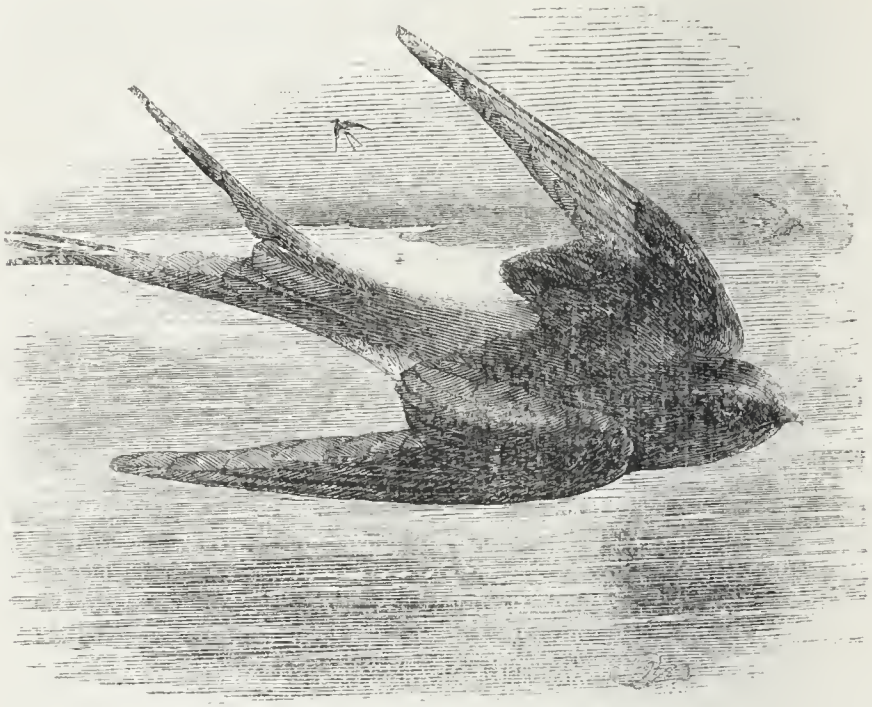
The experiments which have been made to widen the area of the nightingales' visits, have all unfortunately failed. They were founded on what appears to be a rule with many of our summer visitors,—that the young birds return the following year to the place of their birth; just as salmon return to the river where they were hatched. But these experiments prove that there is no such rule among nightingales—at least, not when interfered with by man. The most remarkable

experiment is recorded by Yarrell, in his "History of British Birds." Sir John Sinclair, that patriotic and indefatigable Scotchman, imported a number of eggs from Covent Garden, and had them placed in robins' nests, near his own residence, in the North of Scotland. The robins' eggs were removed, and replaced by those of the nightingale, which were all sat upon, hatched in due time, and the young brought up by the foster-parents; but in September, the usual migratory period, they all disappeared, and never returned to the place of their birth.

So much for nightingale-culture, by no means so successful, it will be seen, as salmon-culture. Now a word on nightingale-*preserving*. I hope none of my readers will ever think of shooting a nightingale. If to shoot a cuckoo is bad, to shoot a nightingale is very much worse. The nightingale, like the cuckoo, is a friend to the farmer and gardener, for he is an insect-feeder; but, as a songster, he is everybody's friend. Don't *kill* him, then; and, were it not that so many people living beyond his limits would otherwise have no opportunity of hearing his song, I would say, Don't imprison him. However, this, I

suppose, must be conceded to the sovereign rights of man. But the man, or boy, who would *kill* a nightingale,

> "Is fit for treasons, stratagems, and spoils.
> Let no such man be trusted."



THE SWALLOW.

Although we are told, in most of the languages of Europe, that "one swallow does not make a summer," there is no bird, perhaps, which is more associated in our minds with warmth, sunshine, and all that is delightful in our best season, than the swallow. Its rapid and easy flight, its elegant form,

meeting us at every turn, and gliding and glancing about our path,—sometimes coming close up to our face, and then dashing away far out of ken,—make this bird as pleasing to the eye as the song of the nightingale is to the ear, and contribute, no one can tell how much, to our happiness all through the summer. Its song, too, is by no means to be despised. Yarrell well describes it as "a soft and sweet warble;" and many a labouring man thinks less of the toil before him, when, in addition to

"The breezy call of incense-breathing morn,"

he hears

"The swallow twittering from the straw-built shed."

But, in speaking of the swallow, we must not forget other members of the family, which contribute equally to our enjoyment. I will therefore begin with a short sketch of the swallow *tribe,* as many of them, at least, as visit this country. Besides the swallow proper, we have the martin, the sand-martin, the swift, and one very rare visitor, of which Yarrell only mentions four examples taken in the British Islands, the white-bellied swift.

Now the swallow and the martin are so much

together, and so much alike in their habits, that many people do not know the difference between them. The martin then is distinguished from the swallow by its smaller size, and proportionally shorter wings and tail; by the absence of the chestnut patch on the throat; but above all by its white rump, which is very conspicuous when seen from above. The sand-martin is distinguished from the martin by its *much* smaller size; by its upper parts being of a dull mouse colour, instead of the bright blue-black; and by the absence of the white rump. The swift everybody knows by its entirely black plumage, and by its wild screech as it flies.

The whole family feed on insects, and are consequently the friends of man: don't therefore learn to shoot flying by practising on swallows. The swallow, martin, and sand-martin, lay each from four to six eggs; the swift from two to four. The swallow and sand-martin have two broods a-year, the martin three or four, and the swift only one. The swallow's eggs are white, spotted with brown; those of the other species pure white. The martin's nest is easily distinguished from the swallow's by its much neater make, and

by its being covered in at the top, and only entered by a small round hole at the side; the swallow's being *open* at the top, and altogether loose and untidy in comparison. The sand-martin builds in the holes of banks, which it excavates for itself to the astonishing depth of from two to four feet. The swift's nest is made of straw, dry grass, feathers, &c., without any mud. Some naturalists are of opinion that it builds no nest, but occupies that of the house-sparrow, which uses the above materials.

But by far the most interesting circumstance about the swallow tribe, and that which has received the most attention from naturalists, is their *migration*. The swallow arrives in this country generally about April the 10th, the martin a few days later, and the sand-martin a few days earlier than that date. The swift does not arrive till early in May, and leaves us again by the middle of August, staying with us the shortest time of all. The times of departure of the others vary from about September 15th to the middle of October. Stragglers of all the species occasionally arrive earlier and leave later than the main bodies.

It used to be thought that numbers of swallows stayed behind and passed the winter in a torpid state, in holes of rocks, and even beneath the mud of ponds and rivers. This notion had many supporters, even so late as the time of Pennant, and White of Selborne, who both regarded it as doubtful; but it is now quite exploded among naturalists. The occasional appearance of a swallow in winter, or in the early spring, previous to the arrival of the main body, gave rise to this opinion; and it was thought to be confirmed by some individuals having been found alive, but in a helpless condition, very late in the year. There is no doubt that some are occasionally left behind, and that they are sometimes seen on fine days in search of food; but it is probable that they all perish miserably when frost sets in, and insects disappear. I am not aware of any well-authenticated instance of any kind of *bird* becoming torpid, like the dormouse, and many reptiles and insects, and so able to exist without food. The celebrated anatomist, John Hunter, dissected many swallows, and found nothing in their organs of respiration different from other birds; whilst, in all those animals dissected by him, which

are known to sleep during the winter, he found a very different conformation of those organs.

Bewick gives an account of some interesting experiments by Mr. James Pearson, of London, who, between 1784 and 1786, kept some swallows in his house through the winter. They showed no inclination to become torpid; on the contrary, he discovered that the middle of winter was their ordinary season for moulting,—an important operation of nature, requiring a degree of vital energy quite incompatible with a state of torpor.

The migration of our British species of swallow has a wide range. The swallow, martin, and swift, have all been observed as far south as the equator (some say still farther) and as far north as Lapland and Siberia. The martin has been seen in Iceland. From east to west, the belt of country across which they pass includes the whole of Europe and a considerable part of Asia. The sand-martin has been brought from India. Their *line* of migration appears to be direct north and south. Within the tropics numbers stay all the year round, but in all countries lying within the temperate zone and northwards,

they are migratory. This is the case in the Holy Land, where their migration is noticed by the Prophet Jeremiah. The *object* of migration is evidently food. As insects abound in the tropics at all times of the year, the swallows are not obliged to leave those regions to get their living; but in all other climates they appear and disappear with the insects on which they feed.

The natural impulse in these birds to migrate at the usual time is often so strong as even to overcome their attachment to their offspring. This is most noticeable in the martin, on account of its greater number of broods in the year, and the consequent lateness of the last brood. This brood is so frequently forsaken by the parents that about half of it perishes every year.

It is a remarkable fact in all the swallow tribe, though not confined to them, that they return annually to the same spot to build their nests. An experiment of Dr. Jenner's on the swift is so interesting that I must transcribe the passage. He says:—"At a farm-house in this neighbourhood (Berkeley, Gloucestershire), I procured several swifts, and, by taking off two claws from the foot

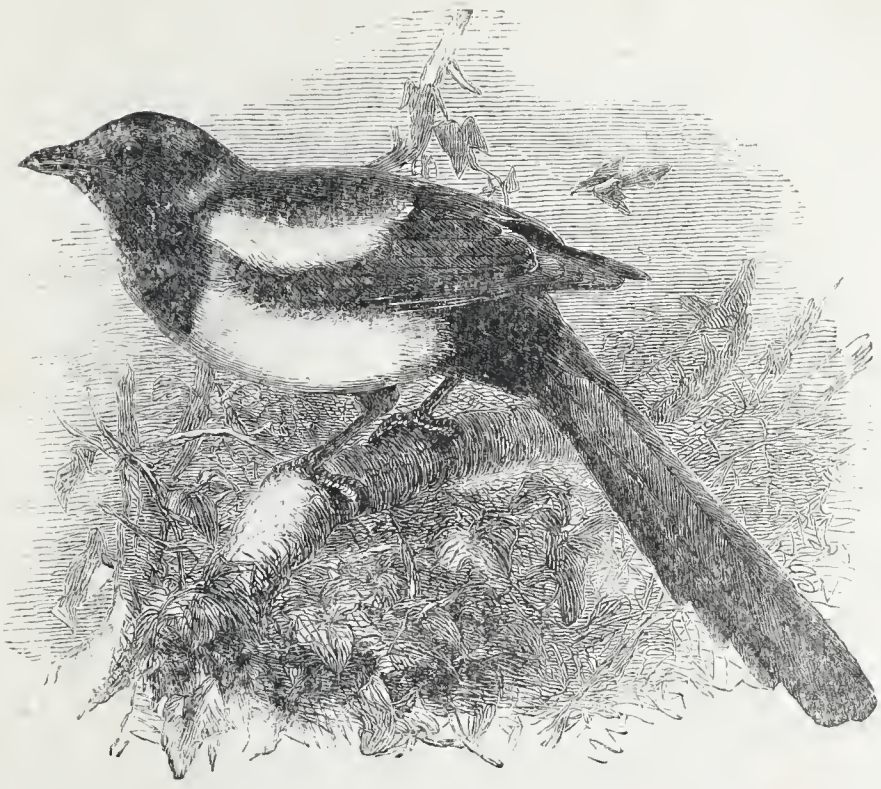
of twelve, I fixed upon them an indelible mark. The year following their nesting-places were examined in an evening when they had retired to roost, and there I found several of the marked birds. The second and third year a similar search was made, and did not fail to produce some of those which were marked. I now ceased to make an annual search, but at the expiration of seven years a cat was seen to bring a bird into the farmer's kitchen, and this also proved to be one of those marked for the experiment."

How wonderful is the force of instinct here! With what unerring fidelity do these unreasoning creatures obey the laws which their Maker has laid down for them! What a humiliating lesson for us, who have reason, and conscience, and divine revelation to guide us! Well might Jeremiah say (chap. viii. 7)—"Yea, the stork in the heaven knoweth her appointed times; and the turtle, and the crane, and the swallow observe the time of their coming; but my people know not the judgment of the Lord!"

Thus do we find ourselves constantly reproved by the dumb creatures around us. May their reproof not be thrown away upon

us! And, from the migration of birds in particular, may we learn the lesson of *faith*, so beautifully expressed by Bryant in his lines "To a Waterfowl:"—

"He who from zone to zone
Guides through the boundless sky thy certain flight,
In the long way that I must tread alone
Will lead my steps aright."



THE MAGPIE.

"MAGGET! Magget!" As I was walking the other day along a back street in meditative mood, my attention was suddenly called, by the above salutation, to a wicker cage hanging over a house door, wherein was a living specimen of a magpie. He did not seem much depressed by his ignominious position.

Whether his moral sense had been blunted by long imprisonment, like many other jail-birds, or whether his natural cheerfulness, like that of Goldsmith's "Disabled Soldier" (see Essays), made him more than a match for any amount of misfortune, I cannot pretend to say; but there he was, as dirty as could be; his once magnificent tail reduced to the size and appearance of an old paint-brush; his free range of wood, and field, and sky narrowed to one cubic foot of back-street air; yet with as arch a look, as wicked an eye, as jaunty a hop, and as great a relish for a practical joke, as when he was in his best days.

I could not help feeling sorry for the poor fellow, although he did not look as if he would appreciate pity; and, much as I admired his magnanimity and his happy way of adapting himself to circumstances, there was a certain something about him which made one feel doubtful whether he were not a great rascal, and, as far as his imprisonment was concerned, the right bird in the right place. I have heard of magpies going about with one wing clipped, so mischievous that no servant could live with them; and in a cage they are

prevented from committing depredations, while their social and entertaining qualities are very little impaired by confinement.

This is a harsh view, and I do not advance it as my own. In fact, I do not recommend the taming of magpies in any way. But let us look at the bird in a state of nature. Were ever such audacity and caution combined? Common as he is, and universally doomed to destruction on account of his predatory habits, he seems likely to remain common still. All hedge-poppers know how hard it is to get round a magpie, and how frequently they have been disappointed in bringing down other game by his derisive cry of alarm, just as the gun was about to be levelled.

A provoking bird indeed is our friend, and we English seem more disposed to resent his practical jokes than to be amused by them. I verily believe that if we treated him differently he would not be half the rascal he now is.

In Norway and Sweden human nature appears to be more genial. There the magpie is encouraged for his amusing tricks, and his life is protected by public feeling. The

consequence is, he is a tame and familiar bird. Mr. Hewitson says, "The magpie is one of the most abundant as well as the most interesting of the Norwegian birds: noted for its sly cunning habits here, its altered demeanour there is the more remarkable. It is upon the most familiar terms with the inhabitants, picking close about their doors, and sometimes walking inside their houses. We saw as many as a dozen of them at one time sitting on the gravestones in the churchyard. Few farm-houses are without several of them building under their eaves,—their nests supported by the spout."

If we, with our morose and unsociable habits, proscribe so clever a bird, and one who has so good an opinion of himself as the magpie, what wonder that he should make reprisals upon us? What wonder that his hand (or foot) should be against every man, when every man's hand is against him? What wonder that he should be as the Arab of the desert, or the Arab of our streets, or the gipsy of our lanes? If generations of outlawry have not completely hardened his nature, there is still hope that generations of kindness might make us good friends.

Then what a beautiful bird he is in a wild state, with his courting suit on! Ignorant and undiscerning people call his plumage black and white. There is certainly a fair proportion of jet black and of pure white; but look at the deep shining blue on the wings, and the bright gleams of blue, purple, and green in the beautifully iridescent and finely-developed tail, and you will agree with me that he is a handsome and showy bird, as well as a clever one.

The magpie's nest is remarkable. You would expect so sly a bird to conceal its nest. But no such thing. It is very large, and often conspicuously placed, as much as to say, "I don't care who knows of my nest: come and rob it, if you dare." But when you climb up to it, you find it a kind of fortress, the outside armed with a "chevaux de frise" of sharp thorns, strongly interwoven, and meeting in a dome over the top. The entrance is on the side, just large enough to admit the bird, and, when she is sitting, is occupied by her head and powerful beak, so that she can either defend it against any foe that she considers herself a match for, or dart out in a moment at the approach of

too formidable an assailant. She lays six or seven eggs, bluish-white, spotted with greenish-brown.

The food of the magpie is various. "No animal food," says Yarrell, "comes amiss to its carnivorous appetite. Young poultry, eggs, young lambs, and even weakly sheep it will attempt to destroy, by first plucking out their eyes" (I wonder whether it does this in Norway). "The young of hares, rabbits, and feathered game share the same fate; fish, carrion, insects, and fruit; and, lastly, grain, when nothing else can be got."

Magpies seem to continue in pairs all the year round, but, in well-wooded countries, where they are abundant, they have been sometimes observed to assemble in considerable flocks, previously to their retiring into the woods to roost. I never remember having seen more than a dozen together, but there are records of twenty or thirty, and one gentleman writes (in the "Zoologist" for 1862) that he once saw in this country a flock of several hundreds.

The geographical range of the magpie is extensive. It was unknown in Ireland in the time of Queen Elizabeth (driven thence,

perhaps, with other noxious creatures, by St. Patrick?) but it is found all over Europe; in the more temperate regions of Asia, as far as China and Japan, and also in most of the United States of America, and as far north as Kamtschatka.

DOVES.

Much has been written and said (it is easy to speak or to write of what nobody knows much about) of the difference between instinct and reason. In these dissertations the subject has generally been the relative *intellectual* gifts of men and other animals. But it must not be

forgotten that the inferior animals not only approach us in intellect, but also in the affections and passions, and in the exercise of a will. And in different families of animals we discern peculiarities of *disposition,* just as we do among men. In birds, for instance, how different the disposition of doves, about which I am now about to speak, and that of the magpie, which was the subject of my last paper! In the latter we see audacity, cunning, and the very spirit of mischief; while, in the former, gentleness, innocence, connubial fidelity and affection, have been proverbial since doves were first heard of.

We have four British species of dove, or pigeon,—the turtle dove, the ring dove, the stock dove, and the rock dove. The first of these is only a summer visitant, arriving about the end of April, and leaving about the end of August; the others stay with us all the year. They are easily separated from each other. The ring dove (wood-pigeon, cushat, or queest) is the commonest, and much the largest of the four, conspicuous by its white feathers forming the portion of a ring on the sides of its neck. The stock dove, so called from its building in the stocks of trees, is

smaller, and without the ring. The rock dove is most like the stock dove, but is rather smaller, and is distinguished from that species by an extra black bar across the wings, and a pure white patch on the lower part of the back. The turtle dove is the smallest, and has four rows of black feathers tipped with white on the sides of the neck.

They may also be distinguished by their different notes and habits. The ring dove, rock dove, and turtle dove all *coo;* but the stock dove's note is quite another thing,—described by Yarrell as "a hollow rumbling," and by Mr. Blyth as "a disagreeable grunt." Then, in habits, the rock dove is the only one that does not frequent woods; indeed, it is very rarely that it settles in a tree, but it is always found among rocks and caves, in the holes of which it makes its nest. Of the other species, the ring and turtle doves make a thin *platform*-nest of twigs among the boughs of trees, while the stock dove again vindicates its individuality by laying its eggs, generally without any attempt at a nest, in the *holes* of trees, and even in old rabbit burrows. Each species lays but two eggs, which are pure white; but some of them

have two or three (the domestic pigeon as many as nine) broods in the year.

It used to be thought that the stock dove was the original parent of our tame pigeon; but there is now no doubt among naturalists that the honour belongs to the rock dove. Its similar cooing note, its objection to resting in trees, and, above all, its habit of breeding in the holes of perpendicular rocks, and in the sides of caves (which we are obliged to imitate by the well-known arrangements on the walls of our houses and in the interior of our dove-cots), are very strong arguments in favour of this view. And when we add to this the fact that tame pigeons will breed with the rock pigeons, and not with the others, and that, when fancy pigeons are neglected in their breeding, they have a tendency to return to the plumage of the rock pigeon, with the two black bars across the wing, the proof of the identity of the rock pigeon with the wonderful and almost endless varieties of the tame pigeon may be considered as conclusive.

In Mr. Darwin's work on the "Origin of Species," the object of which is to prove that all the present species of animals

and plants may have been produced from some half-dozen original forms, by what he calls "natural selection," the subject of fancy pigeons is brought in to confirm his view. He says, that as man has formed the most extraordinary varieties of pigeon by careful selection of breeding, so nature has produced, and is still producing, different species of plants and animals. Now, of course, this is *possible;* but, in order to make it at all *probable,* some undoubted instances should have been brought forward of nature's having so acted. This Mr. Darwin does not do, but he adduces an instance or two of *man* having so acted, which, of course, is no proof whatever that this has been *nature's* plan. And it is a remarkable fact, that, in the instances of man's selection which he advances, particularly that of fancy pigeons, as soon as man gives up his hobby, and nature is left to herself, she quietly proceeds to reduce his varieties to their original type, and the carriers, tumblers, capuchins, and fantails become plain rock pigeons once more.

The range of our species of dove is extensive, that of the rock dove the most so, for it has been seen at Madeira, the Faroe Islands,

and Japan. The turtle dove has not been observed farther north than Northern Germany. All four species are found in Palestine, the turtle dove being a summer visitor there as here. Its migration is mentioned Jer. viii. 7, and Cant. ii. 12. And there are frequent allusions in Holy Scripture to the characteristics of the pigeon tribe: to their rapidity of flight (Psalm lv. 6); to their plaintive voice (Isa. xxxviii. 14); to their harmlessness (Matt. x. 16). A dove was the messenger of glad tidings to Noah, and it was a dove (probably one of our own British species) in whose form the Holy Spirit descended upon our blessed Saviour, at His baptism in Jordan.

It is no wonder then that in some countries pigeons are considered sacred birds. A writer in the fourth volume of the "Naturalist," tells us that in Russia it is called "God's bird," and that to kill it is considered a profanation. "I had one day," he says, "an opportunity of observing myself how the respect for the pigeon prevails amongst the lower orders. I shot six, away from a village, at one shot, and brought them home with the intention of obtaining that master-achieve-

ment of modern cookery — a pigeon pie. When I threw them on the table, a Russian servant who was near, after several ejaculations against my impiety and cruelty, snatched up one of the dead birds, and bursting into tears, began kissing and fondling it."

There is no doubt that the whole tribe do a good deal of damage to the farmer. They eat the wheat while green, also young clover and turnip-leaves, grain of all kinds, and, most of all, peas. Considering this, and also that they are extremely good eating themselves (the ring dove especially is a noble bird when cooked), we cannot be surprised that pigeons are considered fair game; and it is not my intention, as in the case of my former protégés, to condemn the shooting of them. On the contrary, I think that the crowning virtue of these gentle and amiable creatures is, that they are so very good in a pie.

The passenger pigeon, of North America, is included by Yarrell in his "History of British Birds," on the strength of one having been shot in Fifeshire, in 1825. It is distinguished from our native species by its great length of tail and wings. It is remarkable for the

vast flocks in which it migrates from one part of the Continent to another. Some of these have been calculated to extend 200 miles in length, and to contain 2,000,000,000 pigeons. Thousands of acres of forest have been seen almost destroyed by having been selected as their roosting-places,—the grass and underwood by their dung, and the trees by the weight of the birds themselves.

THE WOODPECKER.

"The woodpecker tapping the hollow beech tree."
OLD SONG.

IT is not merely the ability to appreciate sweet sounds that constitutes an ear for music.

The music of nature is not all sweet, but it is all good in its place. The voice of the peacock sounds horribly harsh close to your ear, but heard in its native woods and jungles it is not unpleasing, because it harmonises with the surrounding scene. The same may be said of the cries of parrots and monkeys; of the roar of the lion; of the voice of the thunder; and among artificial sounds, of the boom of great guns, without which the "bugle's warble" and the "trumpet's blare" would sound but tamely at a royal reception. But what I am just now thinking of is the wild note—laugh, shriek, or whatever you like to call it—of the woodpecker. It always gives me pleasure to hear it, for it tells me I am quite in the country, most probably in a woodland country, interspersed with pasture and arable, reclaimed from the wild, but bearing tokens here and there, by old single trees, of having once belonged to it: I could almost describe the sort of country with my eyes shut, if I only heard the note of the woodpecker.

It is of the common green woodpecker that I am now speaking. There are three other kinds reckoned among British birds: the

great black one (of which there is a stuffed specimen in Lord Derby's collection, at Knowsley, but which is nearly, if not quite, extinct in this country); the *great spotted*, and the *lesser spotted;* the second of these is not considered an uncommon bird; the last is more rarely seen, owing, perhaps, to its smaller size. But it is with the common woodpecker that we are all most acquainted; our friend in green, the forest ranger, the merry woodman whose little axe we so frequently hear; the weather-wise bird; the countryman's speaking barometer; Robin Hood's chanticleer; if, at least, the woodwele be the same bird—as some think—for we are told in the old ballad,—

> "The woodwele sang, and would not cease,
> Sitting upon the spraye,
> So loud, he wakened Robin Hood,
> In the greenwood where he lay."

We must not expect an accurate knowledge of natural history in an ancient ballad poet. With us the woodpecker is perhaps never seen "sitting upon the spraye;" and if its notes attain the dignity of a song, they are usually uttered during the bird's short flight

from tree to tree; but, whatever bird the woodwele was, whether a woodpecker, or some species of thrush, there can be no doubt that Robin Hood must have made the acquaintance of the woodpecker in "merry Sherwood," and remarked his appropriate woodland attire; and no one can say that he did not borrow from his plumage his own uniform and that of his men—his own scarlet, from the conspicuous red patch on the bird's head, and his men's green, from the general colour of its body.

The woodpecker is a wonderful instance of *design* in the works of God. It has just those qualifications, and no others (for there is no lavish waste in creation), which fit the creature for the kind of life for which it was intended. It seems to have been made chiefly to feed on, and to keep in check, the insects which prey in the bark and wood of trees. This is the reason why we find it always in well-wooded districts. This is the reason why it has a powerful wedge-shaped bill, and a stout muscular body, to give force to its stroke, and at the same time to keep a firm hold on the tree. The muscles are the strongest where they are the most wanted,—

on the legs and thighs, and in the neck. The muscles that move the short wings being small, the breast-bone to which they are attached is also small, and remarkably low. Hence the short, laboured, and undulating flight, like a succession of jerks, sufficient to carry the bird from tree to tree, and no more; hence its ability to press close to the tree-trunk, which a bird with a high breast-bone could not do, thus throwing the centre of gravity forwards, and diminishing the tendency to fall backwards. Then the length and disposition of the toes, two before and two behind, furnished with strong talons: the downward direction of the tail-bones, and the strong, stiff tail-feathers, pressing against the tree and forming an additional support behind; the wonderful tongue, capable of being darted out and retracted with the speed of lightning, pointed and barbed, and supplied with a tenacious secretion, by glands through which it passes: all these contrivances, which we can well understand, and doubtless others more delicate which are beyond our ken, have evidently one main object,—that of supplying a powerful climbing-bird, to feed on the insects deeply hidden under the bark and in

the wood of trees. This object is perfectly attained in the woodpecker. The little tree-creeper and the wryneck (both birds of similar habits and with certain resemblances in structure to the woodpecker), can dispose of the insects on and near the surface, but those which burrow deeper would soon become a plague, were it not for the larger and more powerful woodpeckers. Parrots are climbing birds, and powerful ones too; but if we had them in this country they could not do the work of woodpeckers. Neither the beak nor the feet of parrots would be of any service to a woodpecker. Parrots are fruit-feeding, nut-cracking climbers; woodpeckers are insect-feeding climbers; each admirably adapted to their respective parts, and to those parts alone.

The study of the different species of climbing birds, especially with regard to their comparative anatomy, is most interesting and instructive. The means adopted by nature to attain the same, or similar ends, seem to be almost infinitely various; and the more closely we look into them, the more are we overwhelmed with wonder at the manifold and complicated, yet simple and easy-working,

machinery of everything we see around us. If a knowledge of natural history do not dispose us to religion, it only shows how fallen we are, how dull and slow of heart, to be able to see all this, and not to break forth in praise to the great Author of it all. There is no sincere Christian, I am sure, who may not find in the study of nature a vast help to his spiritual advancement; and the more deeply and thoroughly he studies any particular branch of natural science, the more heartily and adoringly will he be able to offer up the praise of the Psalmist,—"O Lord, how manifold are Thy works! In wisdom hast Thou made them all: the earth is full of Thy riches!"

It has been already observed, that there is no *waste* of power in creation. The mechanism, which enables the woodpecker to ascend the trunks of trees, prevents him from descending, except backwards. He knows this, and consequently, when he flies off to a new tree for food, he invariably alights near the bottom, and works his way to the top. The light little tree-creeper can run about a tree in any direction; but to have given a bulky bird like the woodpecker

this power would have required so complicated a mechanism, as might have interfered with the laws of beauty and symmetry; and as the object could be equally gained by a modification of the bird's habits, the simpler plan was adopted.

The green woodpecker, however, does not feed exclusively on the insects to be found in trees; it is particularly fond of ants and their eggs, and is therefore more frequently seen on the ground than the other species. Its beak and tongue are of course of the greatest assistance to it here, enabling it to pierce deeply into the ants' nests, and to extract their contents with facility.

Great judgment is shown by the woodpecker in the choice of a tree for its nest. It generally selects one which stands singly in an open space, from which the advance of an enemy can be easily observed and guarded against. The hole in which it lays its eggs, and where also it roosts, cannot help being conspicuous to passers-by from its size; but it seems small for so large a bird, and one would almost wonder how it got in and out. To make it as small as possible is evidently an object in its construction,

but its principal source of security is in the form of the interior. In a nest examined by Mr. Couch, of Polperro, in Cornwall (see "Zoologist," 1858), the hole slanted a little downwards for 7 or 8 inches, and then descended steeply for 2 feet, and the eggs, 5 in number, were laid on the rotten wood at the bottom. They were pure white when washed, but stained when found, by the wet wood on which they had lain. There were two holes in this tree, both occupied by the same pair,—one for the nest and the female bird, the other, he believed, for the male. He had known it tenanted for 30 years; but having examined it in 1858, and thereby caused the enlargement of the entrance, in 1859 he found that the rightful owners had been turned out by a pair of jackdaws, an accident which no doubt would often happen, if the woodpecker were not so particular in making the entrance to her nest as small as possible.

THE KINGFISHER.

Old Bewick, under his inimitable woodcut of this bird, begins thus: — "This splendid little bird is of rather a clumsy shape, the head being large in proportion to the size of the body, and the legs and feet very small."

With the first part of this description we must all agree. "Splendid" is an epithet to which the kingfisher is justly entitled, more, perhaps, than any other British bird. But I demur to the term "clumsy," as applied to his shape, and purpose, before the end of this article, to break a lance with the father of wood-engraving on this question.

But first, as to the splendour of his plumage. His very *name* of kingfisher (the only one we have presumed to give him) may be considered to express the general opinion that, in this respect, he is unequalled. "Born in the purple," his claims to royalty over other birds are as undisputed in one respect as those of the golden eagle are in another. His life is spent in lovely scenes, and of those scenes he is the brightest ornament. To all lovers of brook and river scenery (a class in which every true lover of nature may probably be included), how much is their love strengthened, how greatly their delight increased, by the comparatively rare, and therefore unexpected, apparition of the kingfisher, shooting like a sapphire arrow between the green and sunny bank and its reflection

in the water, or threading with its line of blue-green light some dark woodland brook, like a meteor along the darkness of the heavens!

Now and then the solitary stream explorer is privileged to behold a still more rare and beautiful sight,—the kingfisher hovering over the water in the bright rays of the sun, and suddenly darting upon its prey; or a whole brood of brilliant little kingfishers (the plumage of the young bird is but little inferior to that of the adult) sitting on a stump by the stream, fluttering their wings, and clamorous at the approach of their parent to feed them. The latter sight I never beheld; but I well remember a scene I once witnessed in a backwater of the Thames, at Wargrave, near Henley. I was seated in my skiff, quietly fishing among the water-lilies, when flash went a kingfisher, before unobserved, into the water, and in a few moments up he came again, with a fish nearly as long as himself, into the air. Whether he had more than he could manage, or that he perceived me, I cannot tell, but after a short struggle he dropped the fish and flew away.

The beautiful picture is still fresh in my memory. The sequestered nook,—the still, deep, olive-coloured water,—the white floating lilies, the bright sunshine penetrating here and there through the over-arching trees,—the silver-scaled, dripping, struggling fish,—the gorgeous blue and green and purple and red of the energetic kingfisher. I shall never forget it; one does not witness such a sight more than once in a life, and it is indelible.

"A thing of beauty is a joy for ever." No single combat on the "Field of the Cloth of Gold" could have been more splendid, or half so interesting to the spectators, as that short contest was to me. Naturalists may think that I have made my fish rather too large, as our friend is said generally to prey upon minnows and young fish of about the same size; but "facts are stubborn things," and, as I was quite near enough for a good observation, I can vouch for its accuracy.

Besides small fish, water-beetles and leeches are mentioned by authors among the kingfisher's food. The strong wing-cases of the former are often found in the "castings"

of indigestible matter voided from the bird's stomach in the neighbourhood of its nest, a habit which it has in common with all birds of prey. It is not a bird of passage, though we miss it on our inland waters in the winter. The reason is, that many migrate to the sea-coast before the setting-in of frost, doubtless on account of the greater facility of procuring food.

The *nest* of the kingfisher is a subject of great interest. From the difficulty of finding it, connected with the bird's attachment to the water, the ancients first supposed, and then became firmly convinced, that the nest was built *to float on the water;* and they used to call those days "halcyon days" (their name for the kingfisher being Halcyon) when the sea was so calm as not even to swamp the little nests,—a provision of nature, they supposed, for the protection of kingfishers in their breeding season, and of which they used to avail themselves for their own little ventures on the much-dreaded deep. But natural history in these days is not allowed to rest on supposition; nothing but seeing is believing in this science, and it is now well known that kingfishers make

their nests in holes of the banks of streams (sometimes in clefts of rocks by the sea); that the old holes of sand-martins and water-rats are generally employed for this purpose; that the nest is made entirely of small fish-bones; that the female lays from five to seven eggs of a pure white; and that she feeds her young with small fish which have been softened and partly cooked in her stomach.

Previously to the year 1859 it was a disputed point among ornithologists whether the kingfishers *made* any nest. Some thought that the eggs were merely laid on the mass of fish-bones, often very large, which had accumulated from the castings of the parents. But in 1859 Mr. Gould demonstrated by the following clever experiment that the nest is really *made*. Early in May, he observed a kingfisher fly out of a hole in a bank. By probing it with the end of his fishing-rod he found it extended about three feet in a horizontal direction, and that it probably contained a nest, as some fish-bones were found adhering to the end of his rod after it was withdrawn. He did not disturb the entrance of the hole, but, measuring

the distance, dug a hole on the top of the bank, down upon the place where he supposed the nest would be. He found the usual mass of fish-bones, with four eggs laid on them. These he removed, and filled up the hole he had made, beating the earth down as hard as the bank itself. Twenty-one days after he again visited the spot, probed the hole, found it the same depth as before, and that the bird was within. He then stuffed a mass of cotton wool to the extremity of the hole, to preserve its contents from damage; dug down upon it as before, came upon the cotton wool, and beneath it "a well-formed nest of fish-bones, the size of a small saucer, the walls of which were fully half-an-inch thick, together with eight beautiful eggs (a very unusual number) and the old female herself." The results of this experiment were very satisfactory. It was *proved* that the kingfisher makes a regular nest; the fact of the bird's attachment to old nesting-places was confirmed; also of its altering and adapting any hole it selects to its own purposes, probably by means of its powerful bill.

This nest is now, I believe, in the British

Museum. It weighed 700 grains, or $\frac{1}{10}$th of a pound avoirdupois. By weighing the skeleton of a minnow, an approximate notion might be formed as to how many fish it took to make the nest; and, allowing eight days for laying the eggs, and one or two for the alteration of the hole, out of the twenty-one, one might make a guess, though of course a rough one, at the number of little fish devoured by a kingfisher, or a pair of them, in a day. That he is a very voracious bird has been proved by rearing young ones in confinement; and by the same experiment another peculiarity in the habits of the bird has been ascertained—its determined pugnacity. Mr. Yarrell says, that if young birds in aviaries are not separated towards the end of the autumn, "the strongest will be sure to kill the weaker ones, even to the last bird." This may partly account for the scarcity of kingfishers in proportion to the number of their eggs, which some naturalists have attributed to the young being destroyed by floods. However this may be, I fear we must consider the kingfisher a morose and solitary bird, objecting to interference, and not to be trifled with. Indeed, he expresses

as much in his countenance, which has a moody, savage, and forbidding look, little in keeping with his gay plumage. In the Introduction to the first volume of Bewick, there is a curious passage about the connection between the predatory habits of the kingfisher and its brilliant colours, which I must here transcribe. Speaking of birds in general, the writer says:—"Some are indebted to the brilliancy of their colours as the means of alluring their prey;" and then continues: "of this the kingfisher is a remarkable instance, and deserves to be particularly noticed. This beautiful bird has been observed in some sequestered place near the edge of a rivulet, exposing the vivid colours of its breast to the full rays of the sun, and fluttering with expanded wings over the smooth surface of the water. The fish, attracted by the brightness and splendour of the appearance, are detained, whilst the wily bird darts down upon them with unerring aim." I have not seen this statement confirmed by later writers, and conclude that the bird observed was merely hovering over the water preparatory to his plunge, a method which he sometimes adopts in preference to waiting on the bough of a

tree until a fish passes, without any intention of *attracting* his prey. If attraction had been his object, the display of his *back*, and not his *breast*, would have been more effectual for the purpose, though it would have placed him in an awkward position for striking his fish. But it is a very amusing idea. Anglers know the charms of a gaily-coloured fly for a salmon; but here we have a fisher converting *himself* into the fly for the occasion, becoming bait, hook, line, rod, landing-net, and angler, all in one!

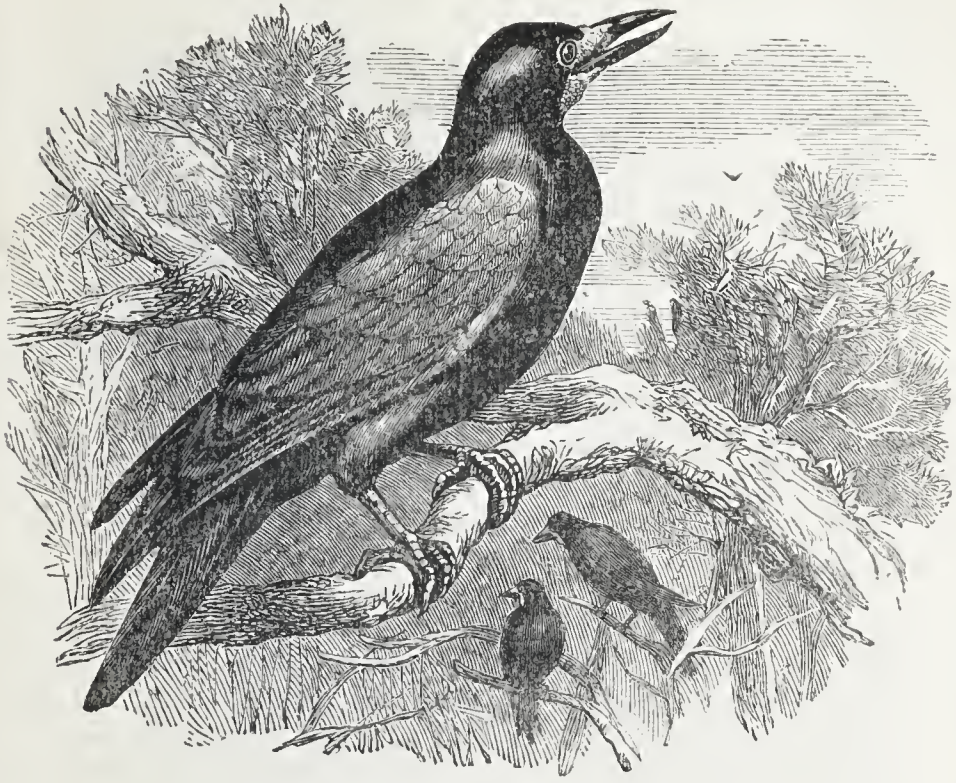
One more of our friend's habits deserves to be mentioned. Humane anglers, when they have caught a fish, generally kill it at once by hitting its head against the butt-end of the rod, or a stone, before dropping it into the basket. The kingfisher does the same. He carries his fish to the side of the stream and kills it, whether from a humane instinct, or from a regard to the peace of his own stomach (for he has to drop it at once down his throat, and not into a basket), will probably never be known.

And now, in conclusion, a word as to the term "clumsy," applied to the kingfisher, which appears to me quite undeserved. We

do not call a St. Bernard dog clumsy, because he is not shaped like the Italian greyhound; and we ought not to call a kingfisher clumsy because he is not so slim as a nightingale or a wagtail. "Clumsy" means awkward, ill-contrived for its purpose. A light and elegant shape would be clumsy where strength and solidity were required, just as massiveness is handsome and pleasing in the same situation. For my part, when I look at the kingfisher, I see nothing that could be altered without detriment. His shape and organic arrangements are exactly suited to the wants of his nature, and to the place he occupies in creation. The stoutness of his little body, with the weight thrown forward and the legs far back, is just what is required for diving, and all diving birds are consequently made in this mould. As his prey is seized only with the beak, *that* should be large and strong, and a large beak requires a large head. The legs are small and the talons weak, because he does not use them as hawks do, in taking and holding his prey. The wings are short, because long wings under water are not so convenient for paddles; yet, short as they are (here comes in the advantage of the stout

body again), the strong muscles by which they are worked can drive the bird with wonderful velocity through the air.

But we may easily forgive old Bewick for this slip of the pen, when from his pencil and graver, guided by the nicest eye for bird physiognomy ever known, we have images of our British birds, which, with all the superior softness and freedom of modern woodcuts, have never been approached in truth of outline, in spirit, or in distinctive bird character.



A TALK ABOUT ROOKS.

In all the different *classes* into which the animal kingdom is divided, we find that certain *families* have a much higher degree of intelligence than others. Among the *mammalia*, or sucklers, the monkey, the dog, the elephant, and the horse may be taken as

examples; among reptiles, the serpent has long had a reputation for wisdom; among insects, the bees and ant enjoy a well-deserved pre-eminence over their fellows. With the habits of fishes, living entirely in a different element, we are less familiar. We all know there are some very "*odd* fishes," and every angler knows there are some very cunning and some very silly fishes; but I am not sufficiently informed about fishes to give the palm of cleverness to any particular family. With regard to birds, however, I have no hesitation in saying that the *Corvidæ*, or crow kind, beat all the rest in intellectual attainments and practical wisdom. It is rather remarkable that most of these select families are gregarious in their habits,—showing, perhaps, that there is nothing like living in society to sharpen the wits and improve the mind; at any rate, no one will doubt that, among the clever family of birds of which I am now speaking, the fact of rooks living in society gives them a decided advantage over the rest of their tribe. They are all clever, especially our old acquaintance the magpie; but there is a wisdom in rooks, due to the necessity of their making laws,

and seeing to their observance, which is not possessed by their relations who live in solitary pairs.

Of the true crows, the genus *corvus*, there are in Britain five species,—the raven, the carrion crow, the hooded crow, the rook, and the jackdaw. The three first are solitary; the two last live all the year in flocks. The hooded crow is partly migratory, remaining all the year in the Western Isles, the Orkneys and Shetlands, and the North of Scotland, but only visiting the southern parts of our island in the winter.

Of the habits of rooks, the first I shall notice is their attachment to man, shown in the choice of their abodes. Every one must have noticed how they choose lofty trees in the vicinity of houses, in preference to any other place of settlement, and this notwithstanding the annual destruction of their young, and their systematic persecution on the lands of their adopted patrons. Instances are known of old rookeries having been forsaken when the mansions near them have been taken down or abandoned; and, on the other hand, we see rookeries in the midst of crowded cities still fearlessly frequented, and

never deserted while a single tree is left standing. Probably this attachment is due to "cupboard love" in some way or other. Where man is, there is a greater variety of food. The rooks are glad of our scraps for a change; and our ploughs turn up the grubs for them, and save their beaks. But I would not say that a kind of fellow-feeling, and an admiration of our social institutions, may not have something to do with it.

It is said that rooks are very sagacious in detecting unsoundness in trees, and that their forsaking a tree may generally be taken as a warning of its speedy fall. The truth seems to be, that the first sign of decay in trees is commonly perceived in the dying off of the upper branches, which renders them unsafe for perching on; and for this reason, and not from any foreknowledge of evil, the rooks remove to another tree.

Rooks are not without their social virtues, though it must also be allowed that they are by no means free from social vices. The male birds, as a rule, are good husbands, and their attentions are reciprocated by the wives. White, of Selborne, says, "As soon as rooks

have finished their nests, and before they lay, the cocks begin to feed the hens, who receive their bounty with a fondling tremulous voice and fluttering wings, and all the little blandishments that are expressed by the young while in a helpless state. This gallant deportment of the males is continued through the whole season of incubation." Captain Thomas Brown, in his edition of White's "Selborne," tells us in a note, that "rooks exhibit much sympathy when one of their fraternity has been killed or hurt by a shot. They hover over their wounded companion, uttering cries of distress, and endeavouring all in their power to render him assistance. If he be able to flutter along, they animate him with their voices, and, by advancing a little in front, try to induce him by their example to follow." I have never been fortunate enough to witness such a display of kind feeling when a rook has fallen to my gun; on the contrary, I have generally seen an anxiety on the part of the other rooks to get out of the way. I have no reason, however, to doubt the truth of the above statement, and it is certainly very creditable to

the character of the rook, as a citizen and a friend.

On the other hand, the following extract from Yarrell's "British Birds" seems to show that we must not expect to find Utopia among rooks, but that there are social evils among them, as in other commonwealths. "While the nests are in progress," he says, "considerable clamour prevails at times among the birds, which appears to arise from attempts made to rob one another of the materials employed in building; and it is observed that, while a nest is in progress, one of the feathered proprietors remains near it to guard it against intruders, and its mate fetches whatever may be next wanting to proceed with. It also has been repeatedly noticed, that if a pair of rooks attempt to build their nest in a tree that was previously unoccupied by a nest, and at a distance from the main body, the other rooks invariably destroy the nest. The reason of this is not very obvious, unless intended as a punishment to the separatists for their want of sociability." And, in the same strain, White, of Selborne:—"If a pair offer to build on a

single tree, the nest is plundered and demolished at once." "Some unhappy pairs are not allowed to finish any nests till the rest have completed their building."

Lest any of my readers should see in these glimpses into the economy of rooks any natural sanction to the tyranny and "rattening" of Trades' Unions, I would beg them to consider that the cases are utterly different. These rook-regulations are the laws of the whole rook nation, like the laws of England, and are not to be compared with the rules of a club or clique, which interfere with the liberty of the subject, and set the laws of their country and of humanity at defiance.

A word or two as to the food of rooks. Is the rook to be protected as a friend, or to be persecuted as an enemy? Let us see what his food is. Like all his kind, the rook is a pretty general feeder. He can eat corn, and cherries, and walnuts, and almost anything that we can; but he can also eat what we can't, and that is grubs; and, what is more, these are his staple food, his staff of life. See the flocks of rooks on those meadows! What

are they doing? Stocking away with their strong bills, and chattering, and gobbling grubs of cockchafers, grubs of daddy-long-legs, worms, slugs, and what not. But see how they tear up the roots of the grass! Yes, and a good thing too. Every root of grass you see scattered about most likely had a grub eating it underneath. And it came up easily. If they find a root firm in the ground, they know there is no grub there, and go on to another.

Then see them in the turnip fields! What are they doing there? Clearing the ground of that destroyer of turnips, the caterpillar of the moth, called *Agrotis Segetum,* and eating wire-worms by the dozen, and now and then, we will allow, playfully digging their beaks into a tempting turnip; but seldom when the ground is soft, and there is plenty of animal food to be had.

Now look at them on the newly-sown corn-lands! What are they doing there? Grubbing still, I suppose, and eating corn to their heart's content, no doubt. I know it; but why don't you keep them off? Where is that sleeping urchin, whose duty

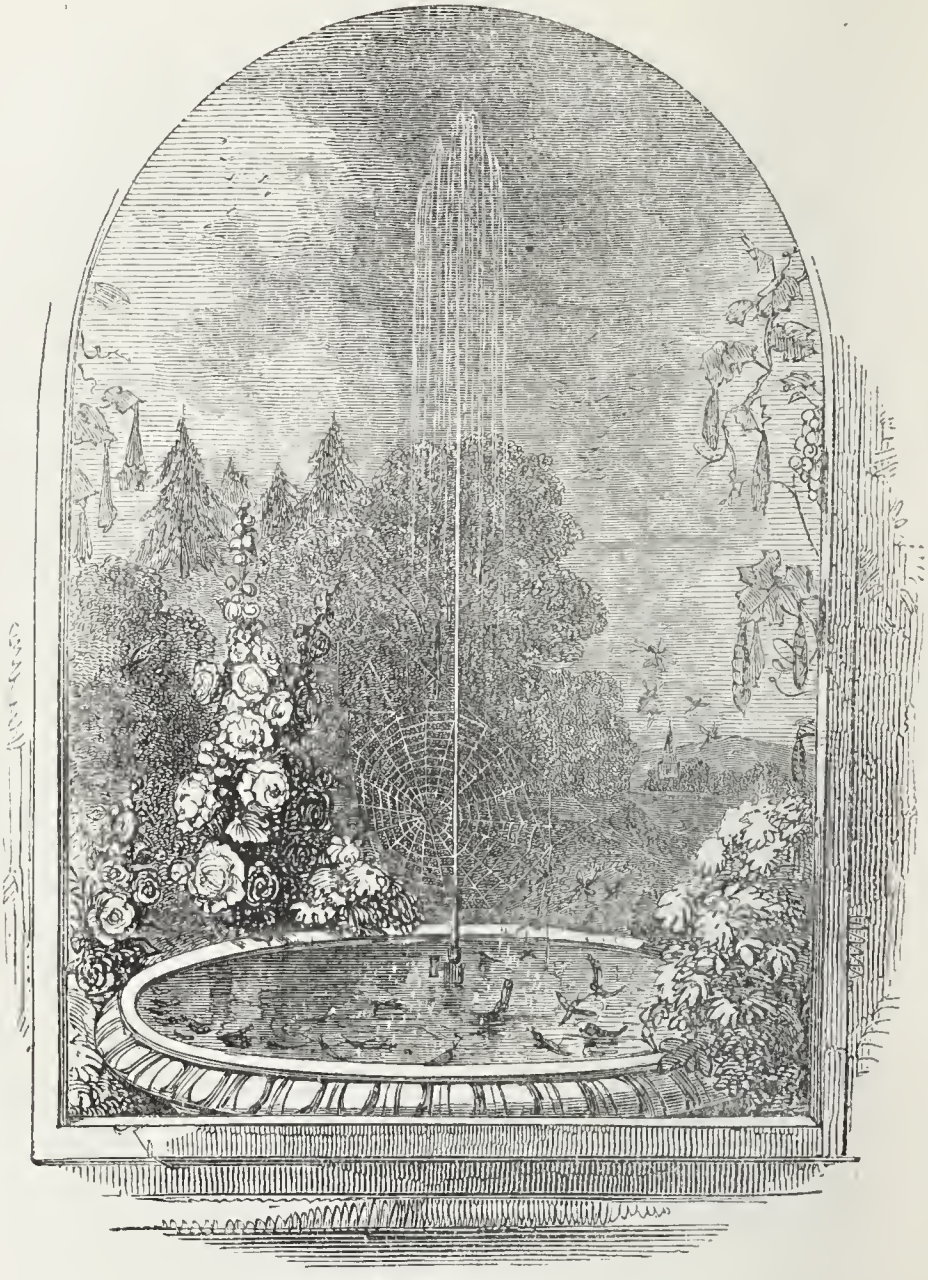
it is to guard this great field from feathered thieves?

"Bird-keeping," as it is called, is an ancient institution which no modern farmer will wisely dispense with; and money is well laid out, at certain times of the year, and in certain fields, in sixpenn'orth of boy and a penn'orth of powder, which amuses the boy, and does the rooks no harm. And we don't *want* to do them harm: they are so useful to us, we can't afford to kill them,—except the young ones, for a rook-pie in the season: we only want to make them understand that, for a time, they must pursue their grubbing elsewhere, and not among our seed-corn, or (where they have less excuse) in our cherry-trees.

Well will it be for the country in general and for birds in particular, when all farmers and labourers learn to know more of their feathered friends and how to manage them. It only requires to keep one's eyes open, to go more by actual observation than by the sageness of traditional ignorance; and, instead of forcible resistance to the arrangements of nature, we shall soon see that the

wisest way is to fall in with them, availing ourselves of that intellectual superiority by which, as rulers of creation, we may control and utilize the peculiar faculties of the inferior creatures to the increase of our happiness and theirs.

DOMESTIC PLAGUES.



WHIMPER

DOMESTIC PLAGUES.

"Domestic Plagues!" I could wish to write rather on "Domestic Pets;" but that is a hackneyed subject; unless, indeed, one were permitted to consider *them* as plagues,— which they frequently are, sometimes plaguing us by dying when we want them to live, and sometimes by an excess of noisy liveliness when we wish them dead. Such a task would have been much more congenial to a mind not insensible to the beauties and amenities of nature, — to treat of doves, and canaries, and love-birds, and dormice and toy-terriers, than (which is my present lot) to write on rats, cockroaches, earwigs, and fleas.

Nevertheless, the "plagues" upon which I am about to write have a story twice as interesting as the most intricate tissue of murders and secret conspiracies that is to be found in any of our popular novels. One great superiority of my domestic horrors to any found in sensational stories will be, that they are all strictly true. And, as truth is allowed to be stranger than fiction, it will either be my fault, or that of my readers, if the thrilling tales I shall have to tell of heroic human suffering, and persistent animal persecution, of siege and stratagem, victory and defeat, are not as full of interest and excitement as is at all desirable for a quiet English family. For I must not forget that my subject is a *domestic* one; and as I shall be obliged sometimes to borrow a tragic dress for my homely subject, to secure its being read, —and I have no wish to frighten children, or to alarm the nervous,—I must take a leaf out of the humane Bottom's stage instructions to "Snug the joiner," and, when my flea comes forth clothed with all the terrors of a lion, be careful to remind my readers that it is only a flea.

Now, domestic plagues are of various kinds,

and what is a plague to one household may not be so to another.

But it is not my intention to go into every kind of domestic plague. Newly-married ladies, therefore, who may think to find some hints in these papers on the management of their servants, will be disappointed, and fathers of families, who, driven to madness by noisy and unmanageable children, rush to consult me on the best means of abating the nuisance, will pronounce me a failure; nor do I mean to include in my list butchers, tax-gatherers, "followers," rag-and-bone men, nor the customary claimants of Christmas-boxes. I will only observe, that a considerable proportion of *this* class of domestic plagues is of our own creating, and is due, in great measure, to our evil and selfish passions. These make us plagues, not only to those we live with, but to ourselves; not only domestic, but personal plagues. These are the great scourges of poor humanity, and I hope that many of my readers need not be told how alone they are to be got rid of. But they do not enter into my present plan. I have to confine myself entirely to *animal* plagues. And here is my

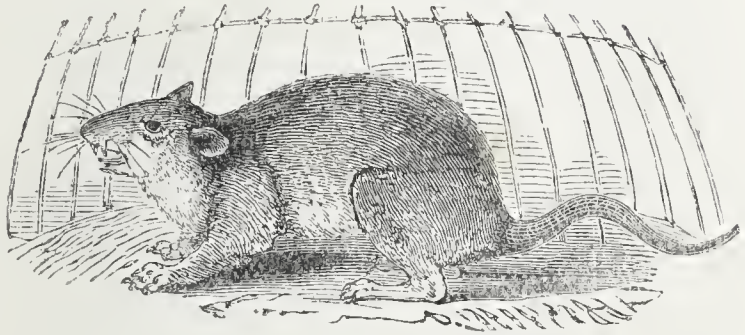
list:—Rats, mice, cockroaches, crickets, earwigs, gnats, and fleas. The honour of standing first I accord to the rats, on account of their higher position among the mammalia or sucklers,—the first class of the animal kingdom.

It will be seen that all the above-mentioned creatures are British, either indigenous, or naturalized among us. And here I would take occasion to remark how thankful we should be to have no more domestic animal plagues than we have. In our favoured climate we have no domestic serpents, coming to share our beds with us; no scorpions, centipedes, tarantulas, jiggers, eye-flies, and other small furies of hot countries. The only tropical pest of any magnitude naturalized in England (and this we may be content to submit to as a reasonable tax upon our commerce) is the cockroach: except, indeed, in the neighbourhood of seaports, where some foreign species of ants, and a few small moths whose larvæ feed on clothes, grain, and fat, have established themselves, and may in process of time become as generally distributed as cockroaches. The rat is the only other naturalized species mentioned in the above

list, of which more will be said in the next paper. The rest, together with flies, spiders, ants, and mites, are either strictly natives, or have been introduced at remote periods beyond human record.

We begin, then, with *rats*. It is a wide subject, an important subject, and a most interesting subject, that of rats! The chest expands, the eyes and nostrils dilate, and the mouth waters, as ideas flow in from all sides upon the writer whose subject is "rats." The famous dog "Billy" was not more sure of his position, when he looked round with pardonable pride on the entertainment provided for himself and his professional friends, than the writer on rats, when he contemplates the abundance of materials at his disposal, and is conscious of the power within him to dispose of each and all to the satisfaction of an intelligent public. "Billy" looked at rats entirely from a physical point of view, while the rat-historian regards them also in their moral and economical aspects; but it must be allowed that the ultimate object both of writer and terrier is the same,—the destruction of the rats; a consummation devoutly to be wished, and systematically to be pursued, but never to be

accomplished—so nature has ordained,—in order that terriers and ferrets may always find employment for their peculiar talents, and ratcatchers never fail to get a living.



RATS.

THERE are but two species, or rather perhaps distinct varieties of rat in Great Britain,—the *black* or *Old English rat*, and the *brown*, or (as it is sometimes improperly called, for it received the name before it was known in Norway) the *Norway rat*.

The black rat is distinguished from the brown by its darker colour, being greyish-black instead of greyish-tawny; also by its smaller size, longer head, and sharper muzzle, larger ears, and much longer tail. The Old English rat, notwithstanding its name, was not noticed in England before the middle of the 16th century; the brown rat came in about the beginning of the 18th; but the second set of colonists have now almost driven out the first, except in some old houses of large cities; and the black rat, formerly as abundant as the brown, is now rather a rare animal. This is easily accounted for by the greater size and strength of the brown rat, and by its greater fecundity, breeding oftener in the year, and producing from ten to fourteen at a birth, while its darker cousin's family rarely exceeds nine. So did those more powerful and prolific rats come down upon the weaker, as the Goths and Huns came down upon the enervated inhabitants of southern Europe, and take their place.

Rats, like the human race, appear to have had an Eastern origin, and to have followed man in all his migrations, so that there is

scarcely a country, where man has been, where rats also are not found. This may be accounted for on the rule, "Birds of a feather," &c. Rats, like men, are omnivorous: nothing comes amiss to them that ever has been or can be eaten; like us, they will eat one another when pinched by hunger. Rats also, like men, are capable of adapting themselves to any climate; and, moreover, they find us a great help to them, storing food for their use, and giving them a free passage in our ships. In short, they get a great deal more out of us than we can get out of them, owing to their far greater acuteness in matters of business. So there is no wonder that rats are man's constant companions, if we look at the question from a "rat's" point of view; and if we look at it from the human side, and wonder that men don't get rid of such companions if they find their attentions troublesome, we are driven, I fear, to the humiliating confession of our own inferiority; we can't get rid of them—they quite beat us; or, if now and then we gain a slight advantage, they soon re-assert the superior dynastic position to

which their talents and perseverance entitle them.

Whether our two rats, and those resembling ours which are found all over the world, are of one species or of several, is a question on which naturalists are not agreed. I am inclined to think, from the evidence before me, that (like ourselves again) they all came from a single pair; and that the different varieties we find in different countries are the joint effect of climate and isolation, or of crossing, as with the varieties of the human race. A great proof of this is, that these rats will all breed together, and their progeny continue fertile; which is not the case with distinct *species* of animals.

I may here remark, that what we call the *water rat* is no rat at all, but a *vole;* much more resembling the beaver in its teeth, its general form (except its tail) and its habits, than the rat. It is a very harmless animal, feeding exclusively on vegetable substances, especially water plants, but has been confounded with the brown rat by careless observers, on account of its being about the same size and colour, and also

because brown rats are fond of ditches and brooks, and are put down as water rats, when seen in such localities. This animal may easily be distinguished from the true rats by its thick, blunt head, small eyes (not *prominent,* as in rats), scarcely perceptible ears, and *hairy* (not scaly) tail.

In their *habits* the black and brown rats are very similar, and everybody knows what those habits are. It is difficult for the most benevolent person to see any advantage to mankind in rats, but I have heard they are excellent scavengers, and, if it were not for them, the drains and ditches would become much more dangerous to human life, from decaying animal and vegetable matter, than they are. This may be true; but, if so, it is but the "one virtue 'mid a thousand crimes," and will weigh little against the heavy damages in the other scale, of which rats have been convicted. They may now and then cleanse a drain, but they much more frequently stop them up, or cut across them in their excavations; sometimes, too, making drains where we don't want them,—between our cesspools and our

wells, for instance, or through the embankments of our reservoirs. Then by undermining the walls of our houses they often put us to greater expense even than by their depredations on our granaries, poultry-yards, and store-rooms. In "Jesse's Gleanings of Natural History," we have a remarkable instance of the voracity of rats, and of their consequent danger to neighbourhoods where they congregate in large numbers. "A proposition was made to the French government for the removal of the horse-slaughterers' house at Montfaucon to a greater distance from Paris; when one of the chief obstacles urged against such a removal was the fear entertained of the dangerous consequences that might result to the neighbourhood from suddenly depriving these voracious vermin of their accustomed sustenance. The report goes on to state that the carcases of the horses killed in the course of a day (and sometimes these amounted to 35) are found the next morning picked bare to the bone!"

Anecdotes of rats are very common. They mostly partake of the nature of clever burglaries, or desperate struggles for life, or

horrible murders by slow torture which make one's flesh creep. With these I shall not indulge my readers; but there are one or two illustrations of the *sagacity* of rats, which should not be omitted, though they are pretty well known to the public by abler pens than mine. One is the way rats steal eggs. It seems that they can abstract eggs from nests in hen-houses, which they can only reach by climbing the supporting posts; and yet they do this without breaking the eggs. One climbs to the nest and pushes an egg to the edge of the platform, and others make a kind of ladder against the post, by mounting on each others' shoulders. The egg is then pushed gently over, and received into the paws of the uppermost rat; the ladder slides quietly down, and the egg is safely landed on the floor, and carefully conveyed, by the united efforts of the rats, to their hole.

Equally clever is the way they are said to have of robbing vessels containing any liquid they are fond of, which are either too deep or too narrow-mouthed to be managed in the usual way. They sit on the top of the vessel, let down their tails into the liquid,

and then lick them, repeating this process till they have had enough.

The old saying, that "rats forsake a falling house," seems to imply a wonderful *foresight* in these creatures; but the truth may be, that the inmates perceive the unsafe condition of their abode, and desert it; and the rats, finding nothing to eat, follow their example; or the emigration of the rats may have nothing to do with the state of the building, but may be merely owing to their having heard of some better quarters elsewhere; yet from this supposed habit we have borrowed the expression "ratting," as applied to persons forsaking their party when it seems likely to become unpopular.

Another anecdote from "Jesse's Gleanings" exhibits the rat in a favourable light as regards his private life, and shows that, as there is "honour among thieves," so is there affectionate tenderness among rats. A friend of his, during a walk, "observed a great number of rats in the act of migrating from one place to another, which it is known they are in the habit of doing occasionally. He stood perfectly still, and the whole assemblage passed close to him. His astonish-

ment, however, was great when he saw an old blind rat, which held a piece of stick at one end in its mouth, while another rat had hold of the other end of it, and thus conducted his blind companion."

MICE.

Although there is more of the "romance of natural history" in the life of the daring and adventurous rat than in that of the quiet mouse, it is pleasing to turn to the latter; not because it is a lesser plague (for its more diminutive size is compensated for by its greater numbers and its even more general

distribution), but because it is not so repulsive and disgusting an animal as the former. Indeed, if it were not so common as to be a *pest*, its prettiness, timidity, and tameableness would quite qualify it to be a *pet*, as it is already in its *albino* or diseased variety, which, to my mind, is far inferior in beauty to the creature in its natural state.

The mouse belongs to the same genus in classification as the rat. There are three distinct species of it in Great Britain,—the common or house mouse, the field mouse, and the harvest mouse. The first needs no description. The field mouse, which is as common in the country as the other in houses, is rather larger, and much prettier in colour; above, yellowish brown (darker on the back); beneath, nearly white. The harvest mouse, first discovered by White, of Selborne, and tolerably plentiful in some localities, but much less common than the two others, is the smallest British quadruped, and the dearest little pet, that ever delighted the eyes of man, woman, or child. It is so small that it can walk up a stem of wheat, to feed on the ear, without breaking it. White says that "two of them in a scale weighed down

just one copper halfpenny, which is about the third of an ounce avoirdupois;" while a full-grown house mouse, he says, weighs "one ounce, lumping weight, which is more than six times as much as the mouse above."

The fur above is reddish-brown; the under parts, pure white; the two colours being separated by an abrupt line. The nest is described by White as being "most artificially platted, and composed of the blades of wheat; perfectly round, and about the size of a cricket-ball, with the aperture so ingeniously closed, that there was no discovering to what part it belonged. It was so compact and well filled that it would roll across the table without being discomposed, though it contained eight little mice that were naked and blind." It is suspended between the stems of corn, and so carried by the unsuspecting farmer to the rick, where it lives in plenty through the winter, *not* in a torpid state (unfortunately for the farmer), though that is its normal condition when in poorer quarters.

Besides these true mice, there are two other creatures which are confounded with

mice by the uninitiated,—the field vole, sometimes called the short-tailed field mouse, and the bank vole, bearing the same resemblance to them as the water vole to the rat. These may be distinguished from mice (just as the water vole from the rat) by their small eyes and ears, and short tail. Then there is the pretty little dormouse, easily known by its soft fur and bushy tail; and the long-snouted shrews (three species), with their velvety mole-like coats. Mysterious creatures are the shrews (I speak now of the common kind); cats kill but will not eat them. In the autumn they die off in large numbers; nobody knows why. Then there is their past history. No animal ever had a worse reputation in the times of ignorance; and those times, as far as natural history is concerned, are not yet gone by.

It was supposed to cause all sorts of diseases to cattle by merely running over their bodies when asleep, and its bite was considered fatal. Whence such an ill opinion could have arisen it is impossible to tell, unless it was from its quarrelsome nature, for it has been observed by a modern naturalist, that it is rare to see two of them together except

in the act of fighting. Sharp tempers and sharp noses, we know, often go together, as well in the human shrew as in the shrew mouse. But, really and truly, shrews (not the human) are among the most harmless, or rather the most useful, creatures, for they live on worms and insects; we may regard them, therefore, as a notable instance of the uncharitableness so common — of imputing evil to reserved and retiring persons whose characters we do not understand.

But it is time that we return from this rambling digression about the mouse's relations and connexions, and confine ourselves to mousie himself, or rather to those members of the true mouse family which have earned the high distinction of being domestic plagues. This enviable honour is about equally shared by the house mouse and the field mouse. The latter "mars the land" (1 Sam vi. 5), as it has done since, and probably long before the time of the Philistines,—while the former ravages the house, and often helps its country cousin in pillaging the rick-yard. Frequently in pulling down a single rick several bushels of mice of different species have been destroyed, besides the numbers which must have

escaped. The damage done by the field mouse in corn-fields is very great, though this may not be strictly a domestic injury; but it is also far too well known in the kitchen garden; and those who pride themselves on early peas owe many a disappointment to this pest.

No one can quarrel with the farmer for destroying field mice by the bushel, when he finds them feeding on his ricks; but, strange to say, when he walks over his farm with his gun, he becomes a strict *preserver* of mice by ruthlessly shooting every owl, kestrel-hawk, stoat, and weasel that he sees. Now, these are the natural enemies of the field mouse, just as the cat is of the house mouse; and killing them is like killing a good cat in a house overrun with mice. All the traps we may invent, and all the means of destruction we may employ, are weak, compared with Nature's provisions for keeping her various subjects within bounds, and we show our wisdom by following her plan. One good cat in a house is better than a hundred traps. Mice get suspicious of traps after a time, and toasted cheese loses its attractions.

It is true that they are more easily caught

in traps than rats are, and one sees sometimes a row of sable hind-quarters projecting from one long trap of many divisions, showing that mice (like the perch that Isaac Walton compared to sinners) sometimes rush headlong to their ruin, regardless of the fate of their companions; but the lessons of experience have their effect in time, and traps become as harmless as the village "stocks;" while no amount of experience can protect mice from the cat (that terrible detective, judge, jury, executioner, and grim death, all in one), whose mere presence is enough to keep mice in their holes.

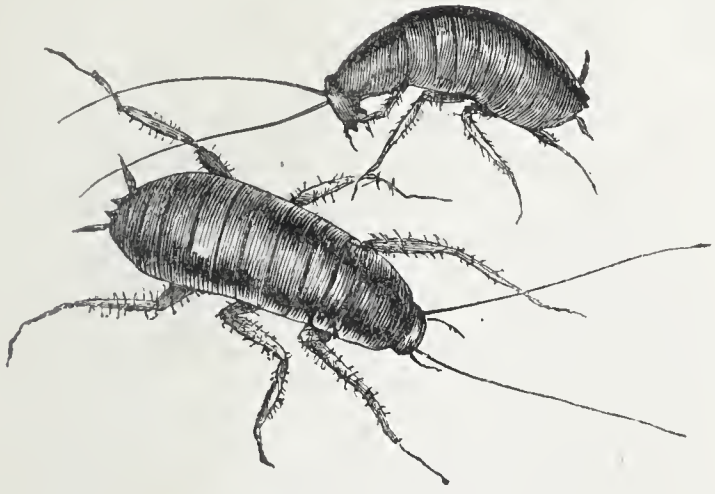
Get then a cat, of the Whittington breed, if possible, and your domestic plague is no more. But put not your trust in traps, nor in poison, nor in any nostrums or charms, or the mice will beat you. When your cat dies, get another. Safe from the depredations of mice under your feline protector, you may perhaps, dear reader, have leisure and opportunity to observe their amusing ways. I esteem him a happy man, though a bachelor, who, in the solitude of the evening hour, has been so still with his book, that the mice come out of their holes, and wash their faces,

and perform other pretty little domestic manœuvres in his presence. He takes his eye from his book, however interesting, and will be stiller than a mouse, while he is permitted to be a spectator of one of Nature's finest touches.

It is well known that mice are fond of music; and the prisoner in his cell, consoling himself with his flute or fiddle, has been delighted to find an attentive audience of mice; but some of my readers may not be aware that mice themselves sometimes exhibit considerable musical powers. In a parish where I lived some years ago, a shoemaker had often heard in his cottage a musical mouse, and at last he succeeded in catching it. He kept it in a suitable cage, and gave out that he had a singing mouse which sang like a nightingale. I went to hear it, and was much surprised at the compass and variety of its notes. They were not unlike some of the passages in the nightingale's song, but they wanted power,—a kind of internal warble, low but pleasing, reminding one very much of ventriloquism.

The mouse has been a favourite with fabulists and poets from the earliest times.

The fables of the "Mountain in Labour," "The Town Mouse and the Country Mouse," "The Mouse and the Lion," are of great antiquity. But of all the poets of any age or language, I know of none who has so exquisitely depicted the mouse as Burns. I should like to conclude this paper by transcribing at length his beautiful, touching, and *humanising* little poem "To a Field Mouse;" but I have no room. All that I can do is, to advise everybody to read it who has not read it, and those who have read it to read it again. I hope the sentiments it so beautifully expresses may tend to restore "Nature's social union" between mice and men, which the poet complains that man has broken,—so far, at least, as may be consistent with our reasonable domestic comfort; and I earnestly recommend his kindly sympathy with his "fellow-mortals," the lower animals, and his readiness to draw a moral from their ways, to the study and imitation of all.



COCKROACHES.

The Animal Kingdom is divided into several great divisions, called *classes;* the first five of which are sucklers, birds, reptiles, fishes, and insects. After rats and mice there are no other domestic plagues that we owe to the first class, the sucklers. The next great division, the birds, furnish us with no example. The house sparrow was once in bad repute, but of late years the tide of human opinion has been in his favour. Of the third

class, the reptiles, there are none that can be called domestic plagues in this country, though with our friends in India it is by no means an uncommon thing to find a deadly serpent coiled up in the bed. We may of course pass over the next class, the harmless and useful fishes. We then find ourselves landed among the insects, to which class most of our other domestic plagues belong.

It will be well, therefore, to say here a few words about insects. In the old system of classification by the great naturalist, Linnæus, the name was applied to all creatures whose bodies were divided *into sections,* or composed of a series of rings; but this definition was afterwards found to include so vast a multitude of ill-assorted beings, that the term "insect" was limited to such ringed or *insected* forms as appeared to have their rings arranged in three main divisions—a head, a thorax or chest, and an abdomen or body. This is very noticeable in a wasp, and it can be traced more or less in all creatures, whether winged or wingless, which are now admitted into the class of insects. Another unfailing distinction is, that insects have six

legs, and six only, attached to the thorax, and two *antennæ* or horns attached to the head, after they have arrived at their perfect state. For it must also be noticed that all true insects have different states, or stages of being, into which they enter by what we call transformation. Their first state is that of the egg; the egg becomes a *larva*, or caterpillar; the caterpillar a *pupa*, or chrysalis; and the chrysalis in due time is transformed into the perfect insect. So there are four stages in the life of every insect, the last of which only is capable of reproducing its kind and becoming the parent of a new generation. Insects are divided by naturalists, according to certain peculiarities of structure, into several *orders;* in one or other of which each of the insect plagues, which I have selected for our consideration, will be found.

The first of these that I propose to talk about is the cockroach, or what is more commonly called the black-beetle. I hope some of my readers will give up this name after reading this paper, because the cockroach is not a beetle at all, but belongs to a different order of insects. Beetles have hard

horny wing-cases, meeting in a straight line down the back; but in cockroaches the wing-cases are of a leathery texture, and overlap each other towards the tips.

Get a dead cockroach and examine it. You will see plainly the three main divisions I have spoken of, the six legs, and the two long *antennæ* or horns, showing it to be a true insect. But it is doubtful in which of its stages of transformation your specimen may be. In moths and butterflies (of the order *lepidoptera*), the larva, chrysalis, and perfect insect are very different; but in insects of the order *orthoptera*, to which the cockroach belongs, they are very much alike. The perfect insect only differs from the pupa and the larva in having wings, the pupa having merely the rudiments of wings, and the larva still smaller rudiments. But this distinction only holds in the case of the perfect *male* cockroach; the perfect female has no wings, or only the rudiments, and looks like a large pupa. You must therefore examine several specimens before you will be able to distinguish the three latter stages of this insect. But the egg state is perhaps the most curious and interesting. If your kitchen is pretty

well off for cockroaches, you may have observed adhering to the wall a dark brown case, something like the pod of a vetch, but still more like a long shallow carpet-bag without handles. This contains the eggs of the cockroach. Most insects lay their eggs one by one, like a hen, but the cockroach lays a *case* of them all at once. The case is about half as large as the abdomen of the female, and is borne about by her for a considerable time before extrusion.*

The cockroach is not indigenous in this country, but was introduced, it is said, in trading vessels from the East, at what time is not known: the earliest notice of it by any

* Westwood, in his "Introduction to Entomology," says: "Although composed of a single piece, the edge along one side" (where would be the opening of the carpet bag) "is slit, the margins of each side of the slit being denticulated and fitting into each other, and being cemented together so strongly, that the other portions are even less strong than at the union of the sutures. Nature has however provided the inclosed insects with a key to this prison, enabling them to escape at the fitting period; this consists of a fluid, which they emit, which softens the cement of the denticulated margins, and affords to the young captives the means of escape from a situation in which they had previously attained a sufficiency of strength to enable them to follow their habits."

naturalist was in 1634. It still betrays its tropical origin by its attachment to warm places, such as kitchens and bakehouses, where also it is pretty sure of a regular supply of food. Its habits are nocturnal, rarely appearing by day, or even by gaslight. In some of the underground kitchens in London, as soon as the servants are gone to bed, the cockroaches are said to swarm out in such numbers as completely to cover the floors; but if anybody comes in with a candle, they immediately begin to scamper away to their holes. They will eat anything, animal or vegetable,—even woollen stockings, linen, and paper; and they eat in all stages of their existence, except that of the egg. Now, with moths and butterflies, it is only the larva that eats. Anybody who has ever kept silk-worms knows this: the caterpillar eats fast enough, but the chrysalis and the moth eat nothing. With the cockroach it is different; it is equally active and voracious in the larva, the pupa, and the perfect state; so that it is three times as destructive as insects belonging to some other orders.

Besides the common species, well known everywhere, there is a much larger one, a

native of America, which has established itself at some of our seaports; and other foreign species are taken occasionally in our docks. But to me the most horrible creature is the gigantic cockroach of India. I first became acquainted with this species at one of the stations in the overland route across the Egyptian desert. I shall never forget that interview. It seemed nearly as large as a mouse. We stood facing each other for some time. It was motionless, except its long antennæ; but the rapid vibration of these, and the fiery glare of its eyes, were fearfully suggestive of latent power; and my horror was great, when, at some movement I made, the creature darted off like lightning. I thought it must have alighted somewhere upon me, for I *felt* it all over and through me, but it was nowhere to be seen. Our next meeting was on the Oriental steamer at Suez. Something shot across the saloon floor as we were at dinner, whether running or flying I could not tell, for the monster runs as rapidly as it flies; and then, shut up with these horrors night after night in my cabin, "'twere vain to tell" all I endured. One night, I remember, I awoke suddenly, with

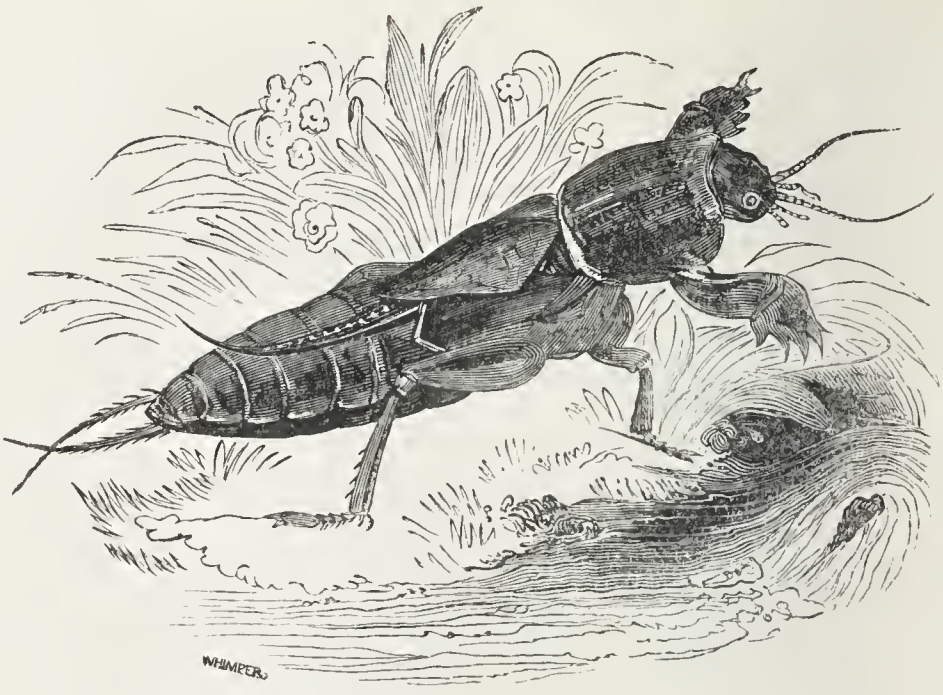
the vivid perception of horny legs *on my mouth* and a disgusting cockroach odour close under my nose. I would advise any of my readers who should ever be similarly circumstanced not to use grease to their hair, for this is sure to attract a circle of cockroaches to nibble at the tresses spread upon the pillow; nor do I know any kind of night-cap that would be of any avail. I can truly say that none of the plagues of India ever had such an effect upon me as this gigantic cockroach. I never felt any shudder at the sight of a serpent or a scorpion; indeed, I used to go in search of them for my collection; but nothing would ever persuade me to handle a cockroach; and I came away from India with a fair collection of insects, but without a single specimen of this disgusting creature. Our domestic species is disgusting to most people, both in appearance and smell; but the Indian kind has all the disgustingness of ours ten times magnified, and its powers of locomotion are something prodigious. You may see it at one moment at the end of a long room, and the next it may be in your hair, or down your throat. You feel no security with such a creature. You are helpless, and he is

all-powerful. If you screw up your courage to attack him with your slipper, ten to one but he escapes you; and if you do succeed in hitting him, it is such a *squash:* he is more disgusting in his death than in his life. Now, our species is a sluggish creature in comparison, and it seldom flies or leaps on you. It has probably degenerated and become tame in our Northern climate, and can no more be compared to its fierce and fiery cousin than a domestic cat to a royal Bengal tiger. Much reason have we to be thankful that our cockroach is no worse than he is. It is very good of him that he does not come out to enjoy his evenings till all the household have gone to bed; and he *must* save the kitchen-maid the trouble of sweeping up the crumbs in a morning, whatever else may be said against him.

It is no easy matter to describe smells and tastes, and I will not attempt it as regards the peculiar savour of our friend; but there can be few persons now living who have not, some time or other, noticed an aromatic flavour in bread, which cannot be referred to wheat, potato, bone-dust, alum, or any other of its usual ingredients: this flavour is

undoubtedly cockroach! Some have fancied that they detected the flavour in certain sauces of great repute, particularly in what is called soy; but I have never heard of its having been adopted by perfumers as a basis for their more delicate scents, as we know they use musk, another animal odour. Yet why should they not? Musk is not a scent universally liked; by itself, I question whether it is not as objectionable as cockroach. Nobody is bold enough to use pure musk as a perfume, yet it enters into many of the most admired bouquets. Why should not cockroach be so employed? Who can tell, without trying, the effect of a judicious mixture of cockroach and jonquil or jasmine? The musk odour is so great a favourite with perfumers on account of its *permanence*. Now, I think cockroach would scarcely yield the palm to it with regard to permanence! I have an old "Butler's Atlas" now before me, which made several voyages to India in merchant vessels between 1859 and 1862, and the cockroach scent is still very perceptible in it, though it has been in use ever since. I would therefore recommend some of our large perfumers to give the cockroach a trial. There is no lack

of the raw material close at hand; and the best way of destroying this domestic plague is, to create a demand for it. Once make cockroach a fashionable scent, and the London kitchens might possibly in course of time be cleared; while the perfumers would not only make their fortunes, but also well deserve the gratitude of their fellow-citizens.



Mole Cricket.

CRICKETS.

Crickets are of the same class and order of insects as cockroaches. There are two species, natives of Great Britain: the field-cricket, a local and rather rare insect, and the well-known house-cricket. There is also the mole-cricket (a most curious creature, very seldom seen), so called from having its

two front legs shaped like those of the mole, and used for the same purpose of burrowing in the ground; but this, owing to the above-mentioned peculiar formation, is placed by naturalists in a different genus, by itself. Our present business is with the house-cricket.

About the propriety of classing crickets with "domestic plagues," public opinion is divided. It is, in fact, a matter of taste. Perhaps more people like their shrill chirp than dislike it. In some houses they are never heard, and what we have not we naturally want to have; in others they are heard occasionally, but scarcely ever seen; while in others they are heard too much, and not only heard, but seen and felt; and it must be owned that their aspect is unlovely, and their creep "gruesome."

Therefore are there divers opinions about crickets: they have their advocates and they have their enemies. It cannot be denied that *sometimes* they *are* regular plagues; though, more frequently, they occur in such moderate numbers, that their company is considered very agreeable. This is my own sentiment. I first became acquainted with crickets at an

old farm-house, where, when a little boy, I used to spend a few weeks in the summer. There was an old-fashioned open chimney, of vast dimensions, in the kitchen, with comfortable settles on each side of the fire, and here the crickets and I used to take sweet counsel together on many a wet evening. I became so attached to them, that, on my return home, I longed to have some there; and at last, through an old servant, I obtained a bottle full, and turned them up in our kitchen. There I never missed them afterwards, and there, for all I know (for the house has passed into other hands), they remain at the present moment. My colony was indeed so successful, that, after no long time, it was strong enough to send out another colony to an adjoining parlour, which was our usual sitting-room. In this they afforded me much amusement, not only by their merry note, but by dashing into the candle, and running over the necks of my sisters, one of whom always drew from such an occurrence the materials for an exciting scene.

But I am digressing from the natural history of the cricket. As there are many people who have never seen our insect, here

is a description of him:—Length, when full grown, about an inch; colour, greenish-grey; head, large and black; antennæ, long; wing-cases lying flat along the back, wings ample; hind pair of legs long, stout, formed for jumping; abdomen terminated by two tails, and in the female by a long instrument called an ovipositor, with which she lays her eggs in the crevices of walls.

The eggs are hatched in about a fortnight, and the young crickets are then about the size of a flea: they arrive at perfection in three or four months. In their physical arrangements the crickets are the same as the cockroaches,—active and voracious in all the stages of their existence, and differing very little in their outward appearance in the several stages; but the eggs are not laid all at once, enclosed in a case, but singly and unprotected, as with insects generally. With regard to habits, they resemble cockroaches in their attachment to kitchens and bake-houses; even surpassing them in their love of warmth, for they commonly make their holes quite close to the hottest fires. Their food also is much the same; that is to say, they eat everything, even one another, and they

drink enormously. This is probably owing to the heat in which they live. If they did not drink freely, their soft bodies would soon be shrivelled up, therefore they affect everything that is moist; wet clothes hung to dry before the fire, they often eat holes in for the sake of moisture; and it is said they prefer newly-built houses, because the mortar is less dry than in old houses, and therefore more agreeable, as well as easier, for them to gnaw in the excavation of their holes. It is because they are such thirsty souls, that they are so often found drowned in pans of water, broth, or other liquid left standing in kitchens.

Crickets are nocturnal animals, though they are sometimes heard by day, and do not seem to have the same objection to light as cockroaches. As it grows dusk they come to the entrances of their holes, and sitting there with only their broad heads visible, they begin their evening concert; and if you keep pretty quiet, they run out with their young ones of all sizes, and pick up crumbs, and bask in the warmth of the chimney corner. The males are the only singers, as in birds; and it seems probable that (as in birds again) they sing in rivalry for the affections of the females; or,

may be, as in the days of knights and troubadours, they are extolling the charms and virtues of their ladies, and challenging each other to those chivalric encounters, which go on, for aught I know, when we are asleep. I cannot say that I have ever witnessed these encounters; but it is said crickets do fight, and very fiercely,—whether for crumbs or crinoline, must always remain matter of conjecture.

It was long a disputed point with naturalists how the cricket's note is produced: its whole body seems to vibrate, and it was a difficult matter to ascertain from what particular part the music came. This is now satisfactorily settled: at least there is every reason to believe that the sound proceeds from a small circular space under the wing-cases of the males, covered with a glassy membrane, something like the drum of the ear, the vibration of which beneath the friction of the nervures produces the noise. Our friend, therefore, is not, strictly speaking, a vocalist, but an instrumental performer, a merry fiddler, who carries his fiddle under his arm, and has no occasion, as our violinists have, to whip it out and clap it to his shoulder, but plays it in

that position, more after the manner of the Scotch piper, as he sits at the mouth of his hole, enjoying at the same time a free flow of perspiration and of song.

It is no wonder that we find the cricket's name connected with many superstitious fancies, when we consider how long it has been the sharer of man's evening leisure, mingling its note with his musings over the fire, and with the eddying rings from the bowl of his evening pipe,—often the only companion of the watcher in nights of storm and danger; of the solitary woman, waiting for the return of a drunken husband, or thinking

> "Upon some darling child,
> Roaming in youth's uncertain wild;"

of the lonely old man who has no one to wait for, and no one to talk to but the cricket, the fire, and possibly a cat. White, of Selborne, tells us: "They are the housewife's barometer, foretelling her when it will rain; and are prognostics, sometimes, she thinks, of ill or good luck; of the death of a near relation, or the approach of an absent lover." Sir William Jardine says that "in Dumfriesshire it is considered lucky to have crickets in a house; but if they disappear from one which

they have long inhabited, it is looked upon as foreboding some calamity to the family."

And now comes the question, how are we to get rid of crickets? (I address myself to that portion of mankind who consider them a plague); or how are we to keep down their numbers, so as to make their presence a matter of indifference, or even a source of pleasure and amusement? Cats will eat crickets freely: and why not, when we eat shrimps? therefore it is well to keep a cat. Secondly, their holes may be blasted with gunpowder, or, if in a downward direction, flooded with boiling water. Lastly, advantage can be taken of their love of drink (if this be not too malicious a method), and vessels of some attractive liquid may be placed near their habitations, in which numbers will be sure to drown themselves. The same liquid may be economised so as to serve for several times, if the vessels be emptied in the morning, crickets and all, into an old tea-pot. The liquid is then poured off, leaving the crickets behind.

EARWIGS.

"*Is anything too hard for the* LORD?" (Gen. xviii. 14.) I am not going to preach a sermon on this text, but to call the attention of my readers to a very small but very remarkable illustration of it. The wider and the more minute our acquaintance with Nature, the more vividly and convincingly are we impressed with the grandeur of the truth contained in that question. It seems as if the Creative Mind had said,—"I will accomplish my object with equal perfection in ten thousand

different ways. Ways, which, to an intelligent mind, will appear peculiarly difficult, I will adopt, and so prove them most simple. I would have men see that I work according to a certain order and method, because I wish them to do the same; but I will show them, by this and that exception, that I am not bound by any method, but that I can make any means useful in accomplishing any end." Such are the impressions produced upon us by the study of Nature, deepening and intensifying as we go on, the impressions of infinite variety and unlimited resource; and we find in the earwig, insignificant creature as it may seem, an apt illustration of these great truths.

The earwig is one of those exceptional creatures which naturalists know not where to place in the system of Nature. There is no other insect like it. So different is it from all others, that it has not been thought sufficient to provide for it a separate *genus,* or even *family;* but it has been exalted into a distinct *order* (Dermaptera), though there are only seven known British species of it. In form it most resembles a large family of beetles, with short wing-cases and long turn-up bodies.

But it altogether differs from beetles in its transformations. In these it agrees with the cockroaches and crickets (Orthoptera), being equally active and of similar appearance in all its stages after the egg; and accordingly next to this order it is at present placed.

The extremity of the abdomen in insects is furnished in different families with a variety of appendages. We have every kind of tail, for ornament or use,—stings, ovipositors, springs for jumping, respirators, and what not; but earwigs alone are provided with *forceps;* and, if we only knew the uses of these instruments, we should doubtless have cause to admire their aptitude; but this we do not know: whether the earwig is the surgeon of insects, as the tench was once supposed to be the physician of fishes, we cannot tell. That they are weapons for the protection of the insect is far more probable; indeed, that it does occasionally use them for this purpose is certain.

A writer in the "Zoologist," of some authority, tells us, that he once saw an earwig "clasp an active beetle round the middle with its forceps, raise it from the ground, and run

off with it, in spite of its most energetic struggles." This is a use worthy of the instrument, but it depends, as far as I know, on a single observation. Then it is asserted that the insect employs the forceps in unfolding its wings, as if the wing-muscles were insufficient for the purpose. What has been said will be enough to show how little is really known on this point.

Let some of my young readers, who have plenty of time to spare, try if they cannot ascertain the truth, by keeping earwigs under glass, where they can be easily observed, and supplying them with food.

Our insect is well provided with the means of defence; for, besides its trenchant jaws and its armed tail, it has the power of emitting a very unpleasant smell when touched, sufficient, I should think, to save its life in many an extremity.

But the most remarkable peculiarity of the earwig is its habit of sitting upon its eggs. It is perhaps an unique instance among insects of incubation. An insect in Van Diemen's Land has been reported to have the same habit; but the evidence rests on a single observation, and we are not sure of the

competence of the observer. Another insect, a kind of field-bug, in our own country, is known to keep her young ones together after hatching, and to take them about with her like the earwig; but the earwig alone, to the best of my knowledge, sits upon her eggs like the common hen, in order, apparently, to hatch them. This circumstance was first observed by the celebrated entomologist, De Geer,* and since that by others: I once observed it myself.

There is another supposed habit of the earwig, from which it derives its name,—that of creeping into our ears. That it has this habit I see no reason to doubt. One well-known naturalist, a little over-anxious to exculpate the maligned earwig, and perhaps a little too much carried away by the prevailing fashion of exploding old prejudices, has invented a new derivation of the creature's

* De Geer removed his earwig into a box, where was some earth, and scattered the eggs in all directions. "She soon, however, collected them one by one, with her jaws, into a heap, and assiduously sat upon them as before. The young ones, immediately upon being hatched, creep like a brood of chickens under the belly of the mother, who very quietly suffers them to push between her feet, and will often sit over them in this posture for hours."

name. He considers ear-*wig* a corruption of ear-*wing*, because the wing of the earwig is something in shape like the human ear. This is very ingenious, but it will not do! There is no doubt that "wig" is from the Saxon for "worm," and therefore "ear-wig" is "ear-worm;" and in most of the languages of Europe, the earwig's name implies the habit of penetrating into the ear. So general an opinion is not likely to be without foundation; and besides, it is in perfect accordance with the earwig's liking for hollow sticks, crevices, lobsters' claws, anything into which it can creep. We who sleep in our beds and are of temperate habits, may not have experienced the questioned intrusion; but it is easy to understand how the swineherd of ancient, and the hop-picker, the harvest-labourer, the vagrant, the drunken husband of modern times, may have picked up in the ditch, and the outhouse, and under the dry arch of the bridge, a practical knowledge of the natural history of the earwig, which justifies its uncomfortable name. Uncomfortable name it is, but particularly to those, of whom there are many, who regard the opening of the ear as a high road into the brain. They have

but little of that useful commodity, and they are quite right to take care of it, and to keep out, if they can, so voracious an insect as the earwig; but you, my intelligent reader, need only to be reminded, that, as there is no passage into the brain through the ear, except to sound, you have nothing to fear from the earwig, except a temporary inconvenience, in which probably the insect itself participates.

With regard to the earwig's food (I speak now of the common garden species) Professor Westwood ("Introduction to Entomology") tells us that it is a vegetable feeder; but we are not to suppose therefore that it is a very strict vegetarian. I have seen it in a state of nature feeding on animal substances, and, when it is in confinement and under stress of hunger, it can be a cannibal. Still it is chiefly as a vegetable feeder that it is injurious to man. To the admirers of flowers and the lovers of wall-fruit, and to those especially who gain their livelihood by growing these luxuries, are they certainly the greatest plagues. It is annoying to find your prize roses and dahlias, of which you have taken so much care, hopelessly scalloped and eyelet-

holed on the very morning of the horticultural show. It is vexatious, when you gather your first ripe peach, to discern a hole in it on the wall side, and within that hole a considerable cavern, in whose luscious recesses several earwigs are regaling themselves. No philosophy can stand such provocation as this. Patience no longer sits on her monument, and makes horrible grimaces in her attempts to smile at Grief, but shakes out the horrid intruders and stamps them under her feet.

And what is the remedy? Catch 'em and kill 'em. But how catch 'em? Don't expect to catch them *all;* but, remembering that all contrivances for catching must be based upon the principle of consulting the tastes of the creatures to be caught, let your garden be well supplied with *hollow* things, and have small flower-pots, or, better still, lobsters' claws (empty of course) at the top of your sticks; examine them every morning, and destroy their contents.

The earwig feeds by night, and the miscreants you kill have done their damage; but you will have the satisfaction of knowing that they, at least, can do no more; and the more

regularly you go your rounds of inspection, the fewer your enemies must gradually become, until they cease to be a pest, and only cause you occasional annoyance.

GNATS.

Gnats, or Mosquitoes (for they are both the same), are of several species, both in this country and elsewhere; but in this country we always call them gnats, and in foreign countries mosquitoes.

The hotter the climate or the season, the more active and energetic, and therefore the more formidable, the little creature becomes, as if it drew vigour and venom from the sun. In dull, cold summers it is drowsy and sluggish, and troubles us very little; but in a hot season we find it far more difficult to catch, its little trumpet* sounds a more angry war-note, and its spear pierces like a red-hot needle. So, much more, in *hot climates*. Humboldt speaks of some districts in the interior of South America which were quite uninhabitable on account of the mosquitoes; of others where the inhabitants were obliged to raise their cabins on high stilt-like piles, to get above the stratum of air occupied by their enemies; other travellers give equally terrible accounts of the torments they have endured in countries and climates most favourable for the production of this pest. The meaning of "mosquito" is "little fly;" but it is an important little fly, to be able to depopulate some extensive regions, and to prescribe laws of domestic economy in others; and still more, to give its name to places and countries,—as *Mosquito* Bay, in St. Christopher's, *Mosquitos*, a town

* The noise is produced by the rapid vibration of the wings.

in Cuba, and the *Mosquito Shore*, in Mexico. But it is not only in tropical countries that gnats are so serious a pest: in Lapland and the icy regions of the north, they are, according to all accounts, equally formidable during those hot summers when the sun never sets.

The gnat or mosquito, belongs to the order of insects called *diptera*, or two-winged flies. In its perfect state it has a light airy form, with long, slender, springy legs. The male is distinguished from the female by its beautifully feathered antennæ, or horns; and it should be borne in mind that the former is quite harmless. It is the female only that bites or stings. Now it is perfectly indifferent to me, my dear reader, whether you say "gnat bite" or "gnat sting." There is something to be said on both sides. In favour of "bite" is the fact of the instrument being situated in the mouth; in favour of "sting" is the construction of the instrument itself, which is to all intents and purposes a sting, on exactly the same principle as that of the bee, though it is not placed, as stings usually are, in the tail. But the proboscis of the gnat is not a sting only, it is also a suction-pump

for the purpose of nutrition, and so may be considered as the proboscis and the sting of the bee united in one. It is a singular fact, that whenever insects in the order *diptera* are furnished with a sting, it is always in this way, the mouth modified; and whenever an insect in the order *hymenoptera* (bees, wasps, &c.) is similarly armed, the instrument is in the tail. And the same rule holds good in both orders as to the possessors of these formidable arms: they belong to the females only. Gnats, horseflies, wasps, bees, ants, and the rest of them are all true Amazons. In the *diptera*, then, we should regard the sting merely as part of an instrument for nutrition, while in the *hymenoptera* it is strictly a weapon of offence and vengeance. The female gnat stings you when it wants a drink of your blood, which in hot weather is rather frequently; the wasp or bee only when you have hurt it, or it fancies you are going to do so. Consequently, gnat stings are very much more common than bee stings, and gnats are a far greater plague to man than bees or wasps. Their name is Legion, their sting sharp, and their venom burning. But, reader, charitable reader, when you know that this

venom is necessary for liquefying the blood and making it more convenient for suction,—when you know that the sting is necessary to tap your vein,—when you consider that ladies with such numerous families as female gnats require a large quantity of stimulant, and that their prodigious fecundity is rather a misfortune than a fault,—when, lastly, you bear in mind that the gnat has no ill-will towards you, but that she regards you as her natural food; charitable reader, I say, will you treat her as the angry bee, or the vengeful wasp?

This is a question of a moral nature arising from our subject which I leave to your calm consideration. But what, you ask, does the *male* gnat live upon? I can find nothing on the subject in any work on natural history, you must therefore be contented with conjecture. It is quite possible that it lives on nothing but air. Many insects eat nothing after arriving at the perfect state; they have eaten so much in the previous states, that they don't require it. The silk-worm moth is a familiar example of this. It may be so with the male gnat. It seems that he has not much to do, and Nature, content with having

made the drone's gorging laziness a warning for industrious bees, places before us the male gnat as an illustration of the text: "If any would not work, neither should he eat." Or he may live on juices that require no tapping. You will see that he has a proboscis like the female, and, though its stinging power is wanting, there is no reason why it should not still be an instrument for nutrition.

But it is time to say something about the earlier stages of the gnat's existence, which are not only most interesting, but a knowledge of which will be of great help to us, in contending with this plague. In the first three stages of its life the gnat's element is the water. The eggs are laid in masses shaped like a boat, so as to float on the surface of the water. As the larvæ are hatched by the warmth of the air they descend into the water, and live there through the larva and pupa states. They do not, however, breathe water like fish, but are obliged from time to time to come to the surface for a supply of air. The air-tube in the larvæ is attached to the tail, and if you get a lot of them from your water-butt, and put them in a tumbler, you will see them often wriggling up from the bottom, and

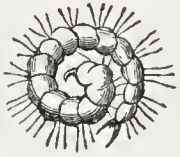
suspending themselves, tail upwards, to the surface, to breathe. Then they will wriggle down again, and feed on the refuse at the bottom, or play about for their amusement. If you keep them in the tumbler for examination, putting in a bit of charcoal to keep the water sweet, some morning you will observe that two or three have altered their form, in fact, turned into pupæ. The fore part of the body is much enlarged, and encased in a kind of transparent mask, while the hinder part, instead of being stretched out at length as in the larvæ, is contracted in size, and tucked under the fore part, like a shrimp. You will observe also that two great changes have taken place with regard to motion and respiration. The larva makes its way through the water by horizontal strokes of the tail, like a salmon in leaping, but the pupa by perpendicular strokes, opening and shutting like a spring; and in this way it makes prodigious bounds, scattering the larvæ before it on all sides. When however it comes to the surface for air, it generally uses no effort, but ascends like a cork, by its own lightness. Then, instead of one tube for respiration at the *tail*, it has two tubes, of quite a different form, projecting from

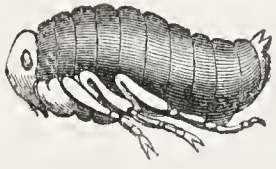
the back of the *head*. Previously to the last change the pupa rests on the surface of the water, in its usual position when taking breath; the back splits down the middle, and the perfect gnat pushes itself out, sits on its skin till its wings are grown, and then takes flight.

And so, you see, the gnat's aquatic and aerial life both begin with a boat. From the boat of eggs made by the mother the young larvæ take their first "headers," and learn to swim in one lesson; from the boat of her own skin, when her wings are dry, the perfect insect mounts for the first time into the regions of air, and finds herself a proficient in the art of flying.

And now what have we learnt to help us against a plague of gnats? Water is necessary to their production, and *stagnant* water, for the *boats* above mentioned would soon be swamped in a stream. If therefore you can choose where to live, don't live near a pool: choose rather a dry hill side. But you can easily breed gnats even there by having a water-butt. Water-butts are the great seminaries for gnats. Abolish the water-butt, and persuade your neighbours to do the same, and if there is no other stagnant water near

you, you will not be much troubled by gnats. It is a question between the comfort of soft water and the discomfort of having your eyes swollen up. Yet there is a middle way. Cover the water-butt so that no gnat can get in it (a difficult matter); then you can enjoy your soft water and save your eyes. It is a good plan to put charcoal in your water-butt to keep the water sweet; but do not suppose, as some people may tell you, that it will prevent gnats from coming. This you will be convinced of by keeping the larvæ in a tumbler with charcoal in it. My own opinion is that the charcoal invigorates them.





FLEAS.

Nobody would suppose, from their appearance, that fleas were very nearly connected with gnats, but so it is. Naturalists may have made a mistake in placing them where they are, for book natural history is not always a fac-simile of Nature's pages, but they have done as well as they could, and so, in spite of their want of wings, fleas are considered as a sub-division of *diptera*, or two-winged flies. If, however, you look at a flea

through a good magnifying-glass, you will see that, although it has no wings, it has the rudiments of them in two large plates or flaps, one on each side of the body, where the wings of insects usually are. What a blessing it is, when we think of it, that its wings *are* mere rudiments! Its powers of motion are in all conscience great enough as it is, to leap 200 times its own length, just as if a man six feet high could leap 1200 feet at a bound. What should we say if it could fly also?

I dare say there are not many people who have seen the egg, the larva, or the pupa of a flea. I have never had that pleasure myself; yet it is certain that the flea is to be seen in all these preparatory stages, like other insects. The egg I have not seen described; but the larva is a long, wriggling, footless grub; and the pupa, enclosed in a silken cocoon, is of the inactive kind, somewhat resembling that of the wasp.

The larva feeds up to a pupa in about twelve days, and the perfect insect emerges in a few days after. So there may be many broods of fleas in a year, and this will account for their swarming so much, when they are allowed to have it all their own way.

The flea seems to be pretty well known throughout the world; but in the East it is perhaps even more abundant than in Europe. Travellers in the Holy Land all bear testimony to the extraordinary numbers of this little torment. Dr. Clarke, as he drew near the Sea of Tiberias, and was hoping to get one night's rest at some place on its shores, was informed by the Arab Sheik, or chief, whom he anxiously consulted on the subject, that "the King of the Fleas held his court at Tiberias." Yet it is only twice that we meet with the word in the Bible (1 Sam. xxiv. 14, and xxvi. 20), and in each case it is spoken of as a little contemptible thing,—an argument perhaps in favour of the cleanliness of the ancient in comparison with the modern inhabitants of Canaan.

There are several species of fleas even in this country. Different animals seem to have their peculiar fleas. There is the dog-flea, the mouse-flea, the mole-flea (a large kind), the flea of the house-martin, and others. Whether these fleas will also attack the human body has been questioned; but there appears to be no doubt that some of them will, though it is most probable that they only

do so in stress of hunger, when accidentally separated from their usual food, and that they stay with us no longer than they can help.

How to get some advantage out of fleas, to compensate for their annoyance to us, is a problem which I only know to have been solved once. Many of my readers probably have heard of the exhibition of "Wonderful Fleas," that went about the country some twenty or thirty years ago. There was a beautiful fairy chariot drawn by harnessed fleas, which, after a journey, were turned out to graze on the exhibitor's hand. I forget the rest of the performance, but I know that the exhibition drew considerable audiences, and I have no doubt that the proprietor made a good thing of it. This is the only instance of which I ever heard of employing flea-power, and getting a profit out of fleas, except indeed the sale of ineffectual nostrums for their destruction.

And now let us turn to this subject. First, as to these nostrums, numerous as receipts for the tooth-ache: have nothing to do with them, they are utterly useless, and some of them may be hurtful to *you*, though they are quite harmless to fleas. Next, a word on

mechanical contrivances for destroying fleas. In the Arsenal at Stockholm, some years ago, was exhibited a piece of artillery (it is probably there still), used by Christina, Queen of Sweden, for this purpose. This is the only mechanical contrivance for killing fleas that I ever heard of, and a very innocent one it must have been. Next we will examine into *Nature's* supposed remedies,—as rue, wormwood, fleabane. I shall be happy to hear from any one who has found any of these effectual. The last has, I believe, quite outlived its reputation. Rue I have often seen used with no good result. Of the virtue of wormwood, in this particular use, I know nothing but the prescription of old Tusser, in "Five Hundred Points of Good Husbandry:"

"While wormwood hath seed get a handful or twaine,
To save against March, to make flea to refraine:
When chamber is sweeped, and wormwood is strown,
No flea for his life dare abide to be known."

The objection to strong-smelling things in the room or the bed is, that the smell must be constantly kept up at a high pitch of nastiness to keep fleas away; and as to destroying them, it is out of the question. Burning strong things for fumigation has a better

chance of success, but this requires care, and is not always practicable.

I have no doubt that, under favourable circumstances, a considerable number of fleas might be thus destroyed; but, after this, the room should be well swept, and the floor scoured with soft soap; and the sweeping and scouring must be kept up, and the fleas hunted in the beds every morning, as long as a single flea remains. Having thus got rid of your enemies, which can easily be done by perseverance, keep them away by cleanliness and vigilance. Have no dust corners in your rooms. Use plenty of soap and water, both in your house and on your person. When you feel a flea, never be satisfied till you have caught it, and I will answer for it that you will never have reason to complain of the plague of fleas.

ANECDOTES OF INSTINCT.

WHIMPER.

ANECDOTES OF INSTINCT.

"The philosopher avers
That Reason guides our deeds, and Instinct theirs.
Instinct and Reason, how shall we divide?"—PRIOR.

HAVING already some notions of my own about instinct, I thought it best before writing about it to see what others thought, and by way of beginning did what I would recommend you, my readers, to do when placed in like circumstances: I looked out the word "instinct" in Johnson's Dictionary, the large edition. I am very glad I did so, for it saved me the trouble of further search. I do not entirely accept his definitions of the word, for reasons which I shall show presently; but I met there with the quotation at the head of this paper, and a very appro-

priate one it is, and in certain other quotations connected with this, and cited by the great lexicographer from our best authors, I thought I saw indications and confirmations of that theory of instinct which I have long held, and mean to hold, until convinced of its unsoundness, or of the greater soundness of some other.

"The philosopher avers
That Reason guides our deeds, and Instinct *theirs*."

Then, according to the philosopher, reason and instinct are quite distinct: the former belongs to men only (including women), the latter to brutes only; or, if instinct ever is found in men, it does not guide their deeds; and if reason ever is found in brutes, it does not guide theirs.

"Instinct and Reason, how shall we divide?"

Well said, Prior! how, indeed? Dr. Johnson's definitions, already alluded to, are (1) "Desire or aversion acting in the mind without the intervention of reason or deliberation;" and (2) "The power of determining the will of brutes." He rather differs there from the "philosopher," for he allows, or seems to allow, instinct to be common to men

and brutes; but he agrees with that personage in disjoining instinct from reason; and he prefers connecting it with the affections (likes and dislikes) and the will. Now, Dr. Johnson, shake thy mighty head and thy fist too at me, while I ask, Who taught thee that instinct is merely a part of the will and affections, and hath nothing to do with the reason? Is it not often far more like reason than it is like the will or the affections? Is it not so like reason that eyes as clear as thine have failed to detect any difference?

I propose, therefore, to take a much broader view of instinct than that of the aforesaid "philosopher," or of Dr. Johnson. In the first place I shall assume, with the intellectual leviathan, that it is a faculty common to men and brutes. This is clear from two or three of Johnson's quotations, one of which will be sufficient for our purpose. Falstaff lays claim to it to excuse his cowardice to Prince Henry: "Thou knowest I am as valiant as Hercules; but beware instinct: the lion will not touch the true prince: instinct is a great matter. I was a coward on instinct." Then, considering the *spiritual part* both of men and brutes as divided into the reason, the affections, and the

will, I should say, in the second place, that instinct enters into *each* of these: that there is, in fact, instinctive reason, instinctive affection, and instinctive will. By instinctive reason I mean that degree of reason which is so much a part of our animal nature that we employ it without effort; it seems to spring up when wanted quite spontaneously: as Pope has it,—

> "Reason comes when press'd,
> But honest Instinct comes a volunteer."

Now, as one volunteer is worth ten pressed men, so this instinctive reason often stands us much more in stead than the more elaborate kind, and to brutes it is almost all they have to depend upon in matters requiring thought. But there are other instincts besides that connected with reason. There is the instinct of the affections,—those natural likes and dislikes through which we are attracted or repelled by persons or things in a way we cannot explain or understand. There is also the instinct of the will, which urges us to do things we do, and do not know why, by a sort of inward presentiment or impulse.

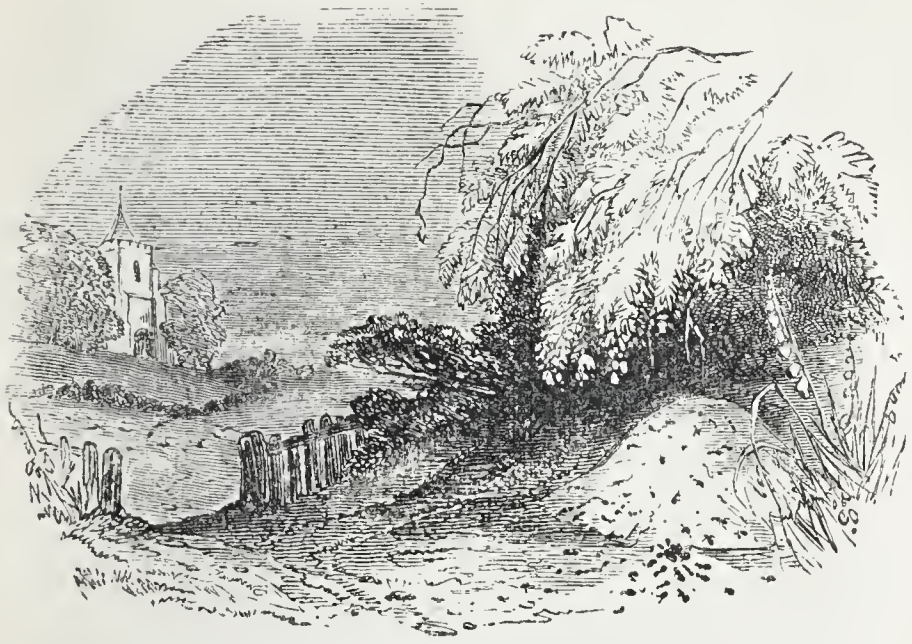
We appear to have all these instincts in common with our dumb friends, but the facul-

ties of which they are the roots have much higher powers of growth and development in us than they have in them. In them these faculties, especially that of reason, although in some species capable of considerable culture, can never go beyond a certain point; in us they are carried on to a much higher point, even in this life, and, if we take into account the life to come, they may go on rising and expanding for ever.

But here comes the question,—Have brutes souls? If they have, their faculties may go on increasing in another life as well as ours, still, however, being subservient to us. But this we do not know. We must have either experience or revelation to assure us on this point, and we have neither. We have experience to teach us that in this life brutes can never rise beyond a certain well-understood level. The most learned pig, we are sure, will never become a philosopher; and the cleverest shepherd's dog will never grow into a shepherd.* This we know; but what will become of the spiritual part of brutes in the

* De Chaillu undertook the education of a young gorilla; but, as far as I remember, the pupil never got beyond brandy-drinking, at which he was very clever.

next life, we don't know: revelation does not tell us. The only text of Scripture that seems to speak on the subject is (Eccles. iii. 21) not clear enough to enable us to come to any decision on the matter; and it is not likely that we shall ever find it out by experience. External evidence there is none, and for internal evidence, we lack that acquaintance with the *thoughts* of animals which might enable us to discover whether they have the same presentiment of a future state which is so valuable an aid to *our* faith in that doctrine. For the certainty of our own immortality we have both revelation and inward experience; for that of our inferior fellow-creatures we have no evidence of either kind. It is therefore an open question. There is no reason whatever why the spiritual part of beasts should perish with their bodies; on the contrary, the analogy of our own case is in favour of its immortality. But we can only guess. Nothing is known. Whereas in our case there is *certainty*.



ANTS.

PART I.

It is a remarkable fact that the greatest instances of intelligence among animals are to be found in the smallest creatures. In the whole range of the animal kingdom there are no living beings whose mental powers approach so near to those of man as ants and

bees, and their connections. Another remarkable thing is, that all these highly intellectual families, except one, the Termites, belong to one order of insects, the *hymenoptera*. Of bees I hope to talk to you later on: our present subject is ants.

There are several distinct species of ants native to Great Britain, mostly pursuing their vocations out of doors, besides some foreign species that are becoming naturalized as domestic plagues in London and in our large seaports. The habits of all these are very much alike, though they have their peculiarities; *national* peculiarities we might call them, for they are complete mimics of the human race in their institutions, and in their ways; but I must confine myself in this paper to their natural history, reserving the more interesting proofs of their intelligence for my next. A colony of ants, then, consists of a queen (or queens), males, and workers (commonly called neuters, but more correctly undeveloped females). These are the three estates of the ant realm—so far the same as bees. Like bees, too, they are inactive both in the larva and pupa states, requiring to be fed and nursed by the perfect

insect; but, unlike bees, the females and males assist in the work of the colony: therefore ants are even a better example of industry than bees. There is really so much to be said about these interesting creatures that one does not know where to begin; but suppose we begin at the beginning.

Picture to yourselves a female ant awaking from her winter sleep some mild day in the month of March. She has no wings now, though she had them, as will be shown presently; neither has she a husband: the winter killed him, as it does all the husbands. She looks about for other females of her tribe,—widows like herself, and left in the same interesting state; and if she finds any, they agree to live together (which queen-bees never do) and to lay the eggs of a new nation; but if she fails in her search, and does not care for company, she sets to work alone to build a small house, and lays the eggs of the new nation all by herself. The eggs she first lays are of that peculiar kind that only produces workers.

Now the workers have nothing in life to do or to think of but work: this is a fortunate circumstance, as there is so much work

to be done. These, with her assistance, soon make the little house a city. Then, when all is ready, she lays other eggs, producing males and females,—some of these females are fertile as herself; others (strange to say) only capable of reproducing males. When this second brood arrive at perfection, being tended through the larva and pupa states by the workers, the nest is a strange scene of bustle and excitement. These young males and females are all winged, the neuters only being wingless. Some fine day in August, when the sun is warm, and the winds asleep, the whole winged population mount into the air in a column. Sometimes the swarms from many nests unite into a perfect cloud of insects; in these the females sail majestically with a hovering motion, while the males dart from side to side among them, selecting their partners: myriads of weddings in mid air is the immediate result. This over, all (those at least which escape the birds and other enemies who are on the watch for them, for they are delicate eating) fall to the ground and cast their wings, having no further use for them. Their joys are of short duration: the males, that live through the day, die soon

afterwards, and of the surviving females some are carried back again by the provident workers to increase their already populous nests; while others are the solitary ones above mentioned, who hide themselves through the winter.

There is an ancient notion that ants store up food, especially grain, for the winter. This may be the case with some foreign ants, but it is not so with British ants: no stores of any kind of food have even been found in their nests; and there is no reason why there should be, because they are all torpid through the winter, and do not require food. The passage in the book of Proverbs (see chapter vi. 6—8) has been thought to favour the notion of *storing*, but, read carefully, it does not seem necessarily to require such an interpretation. Our British ants do not appear to feed on grain at all: they live a good deal on animal food of different kinds, but their most favourite food is saccharine matter, and their usual way of obtaining it is from the aphides which deposit the honey-dew. They are not content however with the honey-dew left upon the leaves of trees and plants, but they actually *keep* aphides, just as we keep

cows, and *milk* them, so getting their favourite food fresh and as they want it. All the aphides, in fact, that are within a reasonable distance of a nest of ants, are the property of that nest; and different individuals or companies appropriate particular aphis-infested twig or branches to their own use, guarding the same from all intruders. At regular times they visit the aphides, as they are sucking the juices of the plants, and tap them on their sides with their antennæ until a drop of honey-dew exudes. When an ant has got all he can from one aphis, he goes to another, and having imbibed as much as he can hold, he returns to the nest, perches on some elevated spot, and delivers himself of the honey, drop by drop, to as many of his fellow-workers as he has been appointed to feed, reserving, we may suppose, a fair portion for his own nourishment.

The work of the nest is almost incessant. Naturalists have observed parties at work at different hours of the night, while the others were reposing, showing that they understand the system of watches. The principal kinds of ordinary work are building and repairing; procuring food; waiting on the queens;

taking care of the eggs, larvæ and pupæ; conveying intelligence; cleaning and sweeping the nests. Their extraordinary employments are wars, which are rather frequent, and founding new colonies, in addition to the annual exodus already mentioned.

Some species of ants are much occupied in slaving expeditions; but these, I am happy to tell you, are not British. There are two species of ants that engage in these expeditions, — *Polyergus Rufescens* and *Formica Sanguinea*. What led to the discovery was the circumstance of red and black ants having been found in the same nest. The red ants were soon proved to be the slave-owners, and (how singular this coincidence with human history !) the black ants the slaves. But it was discovered that slavery among these ants was both more *humane* (if I may so use the word), and far more justifiable than slavery among mankind. In proof of the first statement, it is known that they do not make slaves of adults, but only carry off the larvæ and pupæ, which are incapable of feeling the change; are as carefully nursed as they would have been in their own homes; and when they come to the perfect state, and are

employed in the work of the nest, are as well treated by their enslavers as if they were of their own nation. Also, it has been ascertained that the red ants, from the configuration of their mouths, are unable to provide for themselves.

One more resemblance to us may be here mentioned: ants have times for play, as well as for work; otherwise they would perhaps be as "dull boys" as we should be under similar circumstances. In very warm, genial weather, ants have been seen to assemble in large numbers on the outside of their nests; while some bask in the sun, others have been observed dancing about on their hind legs, wrestling, riding on one another's backs, very much as boys out of school do among ourselves.

Ants are not so useful to man as bees: they make no honey or wax; yet they do give us material help, as well as their moral example: they have contributed to chemistry the valuable liquid called from them formic acid. [*Formica*, an ant.]

PART II.

The following instances of the moral and intellectual qualities (commonly called instinct) of ants are chiefly taken from Gould's "Account of English Ants," published in 1747, and from M. P. Huber's great work, about the end of the same century. The latter author, who may be said to have devoted his life to the study of ants and bees, invented a kind of ant-hive, by means of which he was able to observe their operations without disturbing them. Since the time of these devoted naturalists, although much has been done in discovering new species (Gould only describes five English ants, and now there are upwards of thirty), yet very little has been added to our knowledge of their habits and economy. Modern naturalists seem more anxious to extend the boundaries of their empire than to make themselves acquainted with its contents. However, to proceed with our plan, here are our heads and divisions:—

I. Moral qualities of ants.
   (*a*) Obedience to law.
   (*b*) Loyalty to the queen.
   (*c*) Patriotism.
   (*d*) Family affection and care.
   (*e*) Courage and perseverance.

II. Intellectual qualities.
   (*a*) Cleverness in constructing nests, &c.
   (*b*) Acquaintance with *system* in war, colonization, and public works.
   (*c*) Language.

In the first main division comes—

(*a*) *Obedience to law.* In this respect ants set us an admirable example. Of course those who consider them to be under a set of laws made for them by nature, which they cannot possibly break, will not give the poor ant any credit for this. But I have no doubt that there is more *flexibility* both in the laws of nature and in the instinct of ants, than such naturalists allow; and if so, I have not erred in attributing to the ant an obedience to law very much above that of a mere machine. The following anecdote from Huber will show that ants have it in their power to break laws, as well as to keep them:—

"One day, when he observed many of them tippling very merrily at some water with which he had provided them, he was so cruel as to disturb them, which sent most of the ants in a fright to the nest; but some more thirsty than the rest continued their potations. Upon this, one of those that had retreated returns to inform his thoughtless companions of their danger: one he pushes with his jaws; another he strikes first upon the belly, and then upon the breast, and so obliges three of them to leave off their carousing, and march homewards; but the fourth, more resolute to drink it out, is not to be discomfited, and pays not the least regard to the kind blows with which his compeer, solicitous for his safety, repeatedly belabours him. At length, determined to have his way, he seizes him by one of his hind legs, and gives him a violent pull. Upon this, leaving his liquor, the loiterer turns round, and opening his threatening jaws with every appearance of anger, goes very coolly to drinking again; but his monitor, without further ceremony, rushing before him, seizes him by his jaws, and at last draws him off in triumph to the formicary."

(*b*) *Loyalty to the queen.* Here is a passage from Gould:—

"In whatever apartment a queen condescends to be present, she commands obedience and respect. An universal gladness spreads itself through the whole cell, which is expressed by particular acts of joy and exultation. They have a particular way of skipping, leaping, and standing upon their hind legs, and prancing with the others. These frolics they make use of both to congratulate each other when they meet, and to show their regard for the queen. Some of them gently walk over her, others dance round her. She is generally encircled with a cluster of attendants, who, if you separate them from her, soon collect themselves into a body, and enclose her in the midst."

"Even if she dies," say Kirby and Spence, "as if they were unwilling to believe it, they continue sometimes for months the same attentions to her, and treat her with the same courtly formality as if she were alive."

(*c*) *Patriotism.* This is quite a distinguishing quality in ants. They are the most unselfish creatures. Everything they do seems to be for the common good: shown

in time of peace by helping their countrymen in distress, and by the instant and zealous combination for the repairs of their common abode, which one can at any time call into action by a poke of one's stick; and in time of war, by the most indomitable courage and self-sacrifice, beyond anything we read of in the most heroic periods of man's history. Instances are recorded of their choosing to be torn limb from limb, rather than let go their hold on an enemy; and of whole regiments throwing themselves into a ditch, in order that their bodies might make a bridge for their comrades to pass over.

(*d*) *Family affection and care.* The care that ants bestow on their young, has often been noticed. A very considerable portion of their time is taken up with carrying the eggs, larvæ, and pupæ from one part of the nest to another, so that they may have every advantage that sun or shade can afford. Here I may remark that what are commonly called ants' eggs are really the pupæ, or chrysalids. If any one, indeed, reflected for a moment, he would never think that a thing bigger than an ant could possibly be an ant's egg; but some people don't reflect, and never will.

Of the attachment of full-grown ants to each other, Huber tells us that he witnessed the gesticulations of some originally belonging to the same nest, on meeting with their friends, after an interval of four months:— "They immediately recognised each other, saluted mutually with their antennæ, and united once more to form one family." This shows that ants have pretty good memories, as well as constancy in their attachments.

(*e*) *Courage and perseverance.* Of the courage of ants, I have already given instances under "Patriotism." In proof of their well-known perseverance, the following anecdote will suffice:—

"The quality of perseverance in ants on one occasion led to very important results, which affected a large portion of this habitable globe; for the celebrated conqueror Timour, being once forced to take shelter from his enemies in a ruined building, where he sat alone many hours, desirous of diverting his mind from his hopeless condition, he fixed his observation upon an ant that was carrying a grain of corn (probably a pupa) larger than itself, up a high wall. Numbering the efforts that it made to

accomplish this object, he found that the grain fell sixty-nine times to the ground, but the seventieth time it reached the top of the wall. 'This sight,' said Timour, 'gave me courage at the moment, and I have never forgotten the lesson it conveyed.'"—*Kirby and Spence's Entomology*, Edition 1858, p. 345.

We have now to speak of their intellectual qualities, under the heads of (1) Cleverness, (2) System, (3) Language.

1. We shall not have far to seek in proof of their *cleverness*. It is shown abundantly in the construction of their nests, as well as in their various contrivances for procuring food, and providing for the wants of the community. Each species of ant has its peculiar ways of building and contriving, which are imprinted on the race, and from which they never widely depart; but within these limits there is room for a great deal of freedom in the modification of rules, and in their adaptation to circumstances, and of this freedom we see that ants avail themselves to a great extent. Their dwellings are by no means so symmetrical as those of bees. There is much more variety in the form and

arrangement of chambers and galleries in nests of the same species, than we observe in bee-hives; and, though the plan of the latter is more regularly beautiful to the eye, and better understood by us, the variety of the former gives perhaps the palm of *flexibility* of intellect to the ant. In bees also the materials for building are of one kind, and they have only one kind of food; and in seeking these there is great sameness of method; but both the food and the building materials of ants are various, and give employment to more varied talents in procuring the one and in moulding and arranging the other. And it is curious to observe, that the means they take to accomplish their ends, where intelligible to us, are just such as we should take under like circumstances, showing that their cleverness, as far as it goes, is very much of the same kind as that of man. Nothing will so soon convince any one of this fact as the watching of a single ant, or of several combined, in conveying some large booty to their camp over rough ground.

2. But the greatest proof of intellect in animals is their *combination* for the accomplishment of their designs; and this principle

we find in these minute creatures, no less than among mankind. They act upon *system* in all their great works; whether it be in their public buildings, or in the making of roads, or in colonization, or in their wars,—everything seems to be done upon a system: as they cannot fly though the air like bees (having the use of wings but for a very short time, and then only the males and females), and owing to the slight elevation of their eyes above the surrounding country, they are very apt to lose their way, they are driven, like ourselves, to making roads. This is a great proof of civilization in *man*—savages do not make roads—and I see no reason why we should not allow the same credit to ants. These roads are not mere tracks worn by the constant tread of the ants, but *roads made* by gangs of labourers, "navvies" we might call them;—those of the large wood-ants, as Huber remarks, sometimes a hundred feet in length and several inches wide. Their wars are conducted in the same systematic manner as their other great undertakings. They throw out skirmishers in front, and post troops to cover their retreat. The order of march in some species, when

near the enemy, is rather peculiar. "The advanced guard," says Huber, "usually consists of eight or ten ants; but no sooner do these get beyond the rest, than they move back, wheeling round in a semicircle and mixing with the main body, while others succeed to their station." Thus they seem to advance by a series of loops, and it is supposed that the object may be to communicate intelligence more readily from one part of the column to the other. The battle itself appears to be made up chiefly of a number of single combats, reminding one very much of Homer's battles at the time of the Trojan war. Their offensive arms are their formidable jaws, and in some species, stings, accompanied by the squirting of formic acid, of which the battle-field always exhales a powerful odour.

3. Lastly, a few words as to the *language* of ants. That such intelligent social beings should have some way of communicating their ideas to each other is but natural; and that they have a rapid and effectual way of doing so is evident from the following extracts from Huber and Gould, and may easily be learnt by any common observer.

Huber says of one kind of ants inhabiting the trunks of hollow trees, "That, when he disturbed those that were at the greatest distance from the rest, they ran towards them, and, striking their heads against them, communicated their cause of fear or anger; that these in their turn conveyed in the same way the intelligence to others, till the whole colony was in a ferment, those neuters which were within the tree running out in crowds to join their companions in the defence of their habitation. The same signals that excited the courage of the neuters, produced fear in the males and females, which, as soon as the news of the danger was communicated to them, retreated into the tree as to an asylum."

The other extract is from Gould:—

"Having deposited several colonies of ants in flower-pots, he placed them in some earthen pans full of water, which prevented them from making excursions from their nest. When they had been accustomed some days to this imprisonment, he fastened small threads to the upper part of the pots, and extending them over the water-pans, fixed them in the ground. The sagacious ants soon found out

that by these bridges they could escape from their moated castle. The discovery was communicated to the whole society, and in a short time the threads were filled with trains of busy workers passing to and fro."

Now it may not be correct to call this way of communication *language*, as that word is derived from *lingua*, the Latin for "tongue," and ants have no tongues. Call it, if you like, *pantomime*, or mute action; or coin a new word, and call it *antennage*, as the *antennæ* of the insect appear to be its organs. "What's in a name?" The *thing* is there plain enough, sufficient for converse on all subjects that ants care for, and occupying the same important place as language among us.

And what are we to say to all this? Are not ants very well-conducted and intelligent little creatures? May we not learn something from them? If Solomon, with all his heaven-taught wisdom, thought it not loss of time to study their ways, and recommended us to do the same, there must be something in them *worth* studying, something which by divine grace may make us wiser and better.

BEES.

PART I.

The little honey-bee, next to man, is perhaps the most wonderful creature in the world. It is not only because we know so much more about him than we do about many other creatures, though this may have something to do with it; the truth is, that we

should never have troubled ourselves to investigate his history so minutely, had there not been upon the surface unmistakable signs of riches underneath. Irrespectively of its usefulness to man in a physical point of view, there is no creature the study of whose habits is so full of varied interest and instruction to a cultivated mind as the bee. No wonder, then, that it has attracted the attention of philosophers in all ages. We are told by Pliny, that Aristomachus of Soli, in Cilicia, for fifty-eight years devoted himself entirely to the study of bees; but it was reserved for the blind naturalist, Francis Huber, and his assistant Burnens, who seem to have rivalled in patient industry and accuracy the bees they studied, to open the door into the wonders of the bee-world.

It would be impossible, in the course of a few short papers, to give more than a few peeps into this little world, containing, as it does, such a mass of various and complicated, yet generally intelligible details; but I will do my best to present my readers with a short sketch of the *natural history* of bees, reserving for future chapters an account of their *habitations*, and anecdotes of their

instinct, and perhaps a few words on *bee-culture.*

The honey-bee, then, belongs to the same distinguished order of insects as the ant,—the *hymenoptera.* It is a native of our island, but, owing to its great usefulness to man, like the ox and the sheep, is no longer, as far as I know, found in a wild state; though from a charter of Henry III., which allows every freeman to be entitled to the honey found in his own *woods,* it is evident that it ranged wild in those days, forming its comb in hollow trees, as it would often do now if permitted. A hive of bees consists, besides the young brood, of one female or queen, several hundreds of males or drones, and many thousands of workers, which last are, as with ants, undeveloped females. About 12,000 bees make a moderate swarm. The queen may be distinguished from the workers by her larger size, and longer and more pointed body; the drones, by their stouter and squarer form, and by their very large eyes meeting at the top of the head. The queen lives two years or more,* the workers

* Some modern authors say that the queen bee may live four or five years.

a year, and the drones three or four months.

The queen usually begins to lay in February, at first only worker-eggs; then, about the end of April or beginning of May, a large batch of drone-eggs; then, lastly, the eggs that are to produce queens like herself. After this she goes on laying worker-eggs to the end of the year. It is calculated that she lays about 100,000 eggs of all kinds in the course of the season. It takes exactly twenty days after the eggs are laid to bring a worker-bee through the stages of larva and pupa to the perfect state, twenty-four for a drone, and sixteen for a queen.

There are commonly from sixteen to twenty royal eggs in a hive, and several hundreds of drone-eggs,—more of each than will be likely to be needed, as there can only be one reigning sovereign, and she only requires one husband, and that for a very short period. But Nature is thus prodigal in order to secure those primary objects, a fertile queen and an uninterrupted succession; and that such precautions are necessary is evident from the fact, that the worker-bees have the extraordinary power, *in failure of the seed royal*, of making

one of themselves into a queen. For this purpose they select a worker-grub, not more than three days old, enlarge its cell, by taking in two of the adjoining ones, to the dimensions of a royal cell, and feed it with the peculiar food of queens, called royal jelly, for two days, when it becomes a pupa, and in due time emerges a perfect queen! The royal eggs are laid on successive days, in order that they may come to maturity in succession; and it is so arranged that the first laid shall become a queen by the time that the first swarm has taken place. This is always led by the old queen of the previous season, and it is quite necessary to get her out of the way before the young queens come forth, or she would kill them all, though they are her own children; such is her jealousy of a rival.

The first business of a newly-hatched queen is to ascertain if there is another hatched besides herself; if there is, they attack each other with the greatest fury, and fight till one is killed. The victor then visits the royal cells, tears open those which she knows by instinct to contain a living queen ready to emerge, and kills her; also the whole royal

brood that have advanced as far as the pupa state. If there be no more swarms to come forth besides that which this young queen is destined to lead, the worker-bees encourage her in this "murder of the innocents;" but, if more are expected, they pull and bite and chase her away, notwithstanding their respect for majesty in general.

There are usually four swarms a year from each hive, at various times from April to August; but from the middle of May to the middle of June is considered the best swarming time, and in favourable seasons the four swarms may be all thrown off within the space of fifteen days.

The next great event, after the swarming season is over, is the massacre of the drones. As there are no more young queens to require their attentions, and they do nothing but stuff themselves and consume the winter store, the economical workers are impelled by a natural instinct to get rid of them. Huber tells us how this is done. He saw the workers pursue them to the bottom of the hives, where they were all crowded together; he saw their dead bodies on the ground, and the bees bundling them out; but he never saw them

actually killed,—what was done at the bottom of the hive was beyond his ken. To discover this he had a glass table made, and several hives put upon it, and posted Burnens under the table; and that patient observer saw the workers attacking the drones, and piercing them with their stings between the joints of their armour:—"The moment this fearful weapon entered their body the poor helpless creatures expanded their wings and expired."

I shall conclude this part with a few remarks on the manner in which bees pass the winter. It is now generally allowed that they do not pass it in a torpid state, as was once maintained, and therefore that they require food, however cold they may be kept. The celebrated John Hunter even went so far as to say, of some hives on which he experimented, that the greater the cold the lighter they grew, or, in other words, the more honey they consumed. This, however, has not been confirmed by subsequent observations. The truth seems to be, that although never quite torpid even in the severest frosts, bees are more sleepy and indisposed to eat in the winter, and consequently that it *is* an economical plan to put hives on the north side of a

wall at that season, where the sun's rays cannot reach, and excite them to an unprofitable activity. The very fact of bees storing food for the winter is inconsistent with the supposition that they spend that season in a torpid state, just as the non-storing of food by ants is consistent with their torpidity. How they keep themselves from being frozen during hard winters is surprising, when we know that other hybernating insects, as the larva and pupa of moths and butterflies, are often found converted into lumps of ice (without, however, losing the vital principle); but we cease to wonder when we are told that a thermometer, inserted a little way into a hive, when the temperature outside was six degrees below the freezing-point, speedily rose to twenty-two degrees above it. Huber says it stands in frost at eighty-six and eighty-eight degrees in populous hives. It appears then that these little insects have some way of keeping up animal heat, probably on their grand principle of combination, to a degree far beyond the means possessed by warm-blooded animals.

PART II.

Before we take a peep into the hive to examine that marvel of workmanship, the honey-comb, I would call the attention of my readers to the materials used in its construction and furnishing, and the means by which they are procured. Well may we call the bee a wonderful creature when we consider that it collects, or elaborates in its little body, five different substances,—honey, wax, bee-bread, propolis, and poison.

The first two of these, everybody knows, are eminently serviceable to man,—honey, indeed, before the discovery of the sugar-cane, was almost indispensable to him; and to bees they constitute respectively their food and building materials. *Bee-bread* is the pollen of flowers, which has been chewed (?) by the bee, and is used principally to feed the young brood. *Propolis* is the gum from the unopened buds of poplars and other trees, collected by the bees in early spring, and used as cement. *Poison* is the venom con-

tained in a little bag connected with the sting, and is necessary for self-defence, and for the protection of the other valuable substances just enumerated. Besides these might be mentioned *royal jelly*, the pungent food of queens, which is probably a mixture of some of them.

The honey, as is well known, is collected from flowers, but not exclusively; honey-dew (the excrement of the aphis) and sugar also furnish it. After being imbibed by the mouth, what the bee does not require for its own nourishment passes into the honey-bag, a kind of second stomach into which honey alone enters, whence it is disgorged into the honey-cells on the bee's return to the hive. Whether it undergoes any change in the honey-bag, or remains the pure nectar of flowers, is uncertain.

The wax is not formed from the pollen of flowers, as used to be thought, but from the honey itself, as it is being digested in the body of the bee, and is secreted through certain pores, and deposited on the outside of the body, in what are called the *wax-pockets*, four on each side, concealed between the segments of the abdomen.

Before describing the process of building the combs, it is necessary to observe that the workers in a hive are of two kinds, the *nurse-bees* and the *wax-makers*. The former are smaller than the latter. There appears to be no distinction in their out-of-doors employments, but within the hive, the nurses feed the young and construct the cells, secreting wax only in very small quantities; while the whole business of the wax-makers is to make wax and to carry it to the nurses, being in the same relation to them as labourers to masons. The way this is done is as follows:—

The wax-makers, having swallowed a due portion of honey, suspend themselves to each other in a series of festoons, forming a kind of curtain. They remain almost motionless in this position for twenty-four hours, during which time the wax scales are being formed. One of these bees is then seen to detach herself from the cluster, and to make her way through her companions to the top of the hive. Here she clears a space for herself about an inch in diameter, takes one of the wax scales in her mouth, moistens and kneads it, and fastens it to the top. This she does

with each of her scales in succession, and then leaves the little mass behind her, having in fact "laid the first stone" of the future comb. After the foundress-bee come others, one by one, each adding her contribution to the mass. The result is a little wall of wax, of uneven surface, about half an inch long, hanging perpendicularly downwards in the direction the comb is intended to take. After this a single nurse-bee comes forward and moulds in the side of this wall the bottom of the first cell. She also retires and is succeeded by others. Then, at a certain stage in the work, another master builder is seen to proceed to the opposite side of the little wall, and to sculpture the bottoms of *two* cells, the antipodes to the one first mentioned, and into which that one fits. And so the structure grows, the wax-makers, or hod-men, bringing up at regular intervals the same quantum of wax, and the masons shaping it with their jaws and trowel-like tongues, and measuring the work, as it goes on, with their antennæ, until the comb reaches to near the bottom of the hive; and a beautiful work it is when finished, fresh and white from the masons' hands. It may be briefly described

as a double series of horizontal cells, arranged back to back against a thin upright partition. They are not, however, quite horizontal,—if they were, the honey would run out,—but slightly inclined upwards. All these cells are six-sided, except the first row, fastened to the top of the hive; these are only five-sided, the object being to secure a broader attachment for the comb to the roof, to enable it to support its great weight when full. The combs are placed about half an inch apart, just sufficient room being allowed for two bees to pass on opposite combs without incommoding each other. Besides these great thoroughfares, the combs are pierced at intervals with side alleys, to save the bees the trouble of going round.

The honey-comb has always been the great marvel of mathematicians; they see in it the solution of one of their very difficult problems, namely: "A quantity of material being given, to form of it similar and equal cells of a determinate capacity, but of the largest proportion to the quantity of matter employed, and disposed in such a manner as to occupy the least possible space." Every part of this problem is practically solved

by bees. (Kirby and Spence's "Entomology," p. 273.) Besides this, the *angles* chosen by them, and invariably adhered to, for the sides and bottoms of their cells, were measured by an experimentalist, and a skilful mathematician: Mr. König, who was ignorant of these measurements, was asked to determine the best size of angles to satisfy the conditions of the above problem. The result was as follows:—

Side angles (according to measurement of cells)	109° 28′
Bottom, ditto	70° 32′
Side angles (according to König's calculations)	109° 26′
Bottom, ditto	70° 34′

Thus the mathematician and the bees only differed two minutes in the solution of the problem! But the bees have another difficulty to surmount. They require their cells to be of different sizes,—smaller for the larvæ of workers, larger for those of drones, and often very large cells in good seasons for the storing of the greater supply of honey. Now these all form part of the same comb, and yet there is no appearance of irregularity. The same angles are used in each cell, and

the same number of sides, the difference is made in the diameter and depth only; and, to avoid an unseemly ridge at the juncture of tiers of unequal cells, there are always a number of graduated transition cells between, so as to preserve an even surface, and it is only by a careful examination that the different size of the cells is discovered.

How very wonderful all this is! What a union of utility and beauty do these little architects present for our admiration and imitation! And what I have endeavoured to give is merely a glimpse of their operations; the details of their work and their many and various contrivances, even as far as we know them, would fill a large volume, and there are still mysteries to be solved that reach downwards far beyond our ken, and which, unless we transform ourselves into bees for a time and live among them, we shall probably never know. One other feature of the comb must, however, be mentioned even in this short sketch; that is, the royal cells. These are quite unlike any of the other cells, and are differently placed. Their position is usually on the lower edge of the comb, and is vertical, not horizontal, with the

opening downwards; their shape is something like a pear, and they are made of a coarser material, and much more of it, than other cells.

In my next part I intend to give a few illustrations of instinct in bees, especially as shown in occasional deviations from their ordinary rules.

PART III.

Young bees require no education. As soon as they leave their cradles they are as competent for all the duties and employments of life as the oldest members of the community. Whether they receive any revelations of their future state from the nurses as they feed them in their cells, of course we are unable to say; but whatever they do receive must be *instruction* only: there can be no *training*, which we consider so essential in our schools. We must not however lay it down as the distinction between instinct and reason, that the former is immediate, like a flash; the latter progressive; for this does not hold good in the higher animals. *Their* instinct, judging from horses, dogs, and hawks, is progressive,—just as what we call our reason; and even bees are taught by skilful bee-masters to make their combs in a certain way, as well as to modify their laws and institutions, to suit man's

convenience. And not only can *we* mould their instincts, but they do it themselves. To show this is the chief object now,—to prove by reference to experiments that bees have the power to *deviate* from their usual methods, and therefore that their instinct is not the rigid and inflexible thing which some make it, but pliable and plastic, in the same way, though not to the same degree as our reason.

(1) We see this even in the *combs*, which appear so regular to cursory observation. It is true that the angles of the cells are always the same; but, as they are the best possible angles for the purpose, we cannot wonder at this. A mathematician, with all the powers of reason at his command, would be very foolish to deviate from a form which he knew to be perfect; but circumstances, such as poverty or want of room, sometimes compel bees, as they do us, to adopt an inferior plan in preference to the best: so, when cramped by their ignorant masters, or worried by such experimentalists as Huber, who put bees to all sorts of tests, they will occasionally make cells with flat instead of pyramidal bottoms; or begin their combs on the side

instead of the top of the hive; or they will resort to the most fantastic expedients to avoid glass.

(2) In the collecting of food and building materials we observe the same pliability. A bee-keeper in London kept his bees on the top of his house, and not long ago a poor woman, who kept a toffy-stall in the neighbourhood, was invaded by them in such numbers, and lost so much toffy by their visits, that she was obliged to complain to the bee-keeper, who, finding that his bees were really to blame, reimbursed the woman for her loss. The bees, owing to the scarcity of flowers in London, and to save themselves the trouble of a long flight into the country, found it more convenient to make honey from toffy, which they did, without being aware that they were doing any harm. On another occasion (I think this was in Switzerland), as a bee-keeper's coffin was about to be carried to the grave, a number of his bees were observed to gather round it. Now there are many common superstitions, very foolish, connecting bees with a death in the family, and the neighbours naturally thought that the bees had come to bid farewell to the deceased; but

the real fact was, that his coffin had been very recently varnished, and they had come to it for *propolis*, or cement, — a substance which they usually gather from unexpanded leaf-buds, but which they had found somehow to be equally good when derived from varnish.

(3) The usual habit of bees is to construct royal cells immediately after those of the males; but, if they do not find themselves strong enough to send out a swarm, it is a remarkable fact that they make *no* royal cells. This not only shows how they can adapt themselves to circumstances, but is a proof that they are gifted with a considerable degree of foresight.

(4) The following is from Reaumur, as quoted by Kirby and Spence: — "Bees are extremely neat in their persons and habitations, and remove all nuisances with great assiduity, at least as far as their powers enable them. Sometimes slugs or snails will creep into a hive, which with all their address they cannot readily expel or carry out. But here their instinct is at no loss, for they kill them, and afterwards embalm them with *propolis*, so as to prevent any offensive odours from

incommoding them. An unhappy snail that had travelled up the sides of a glazed hive, and which they could not come at with their stings, they fixed a monument of their vengeance and dexterity by laying this substance all around the mouth of its shell."

These are all instances of *deviation* from the ordinary path, to show that the instinct of bees is something like reason. I will now mention two or three peculiarities, not generally known, of their usual habits. One is, that in returning to their hives they always take a direct line, however far they may be from home at the time they have finished work. The American bee-hunters take advantage of the knowledge of this fact. They place some honey in a saucer out of doors to attract the bees, they then catch two or three when they have well feasted; one they let fly from the spot; then they walk off to some distance at right angles to the line of the bee's flight, and let fly another, observing the line it takes by a pocket compass. If the lines converge, they conclude that the nest will be where they intersect each other; and so they generally find it.

It is often observed that bees pass by flowers which are known to contain abundance of honey. The reason of this is, either that the honey is out of the reach of their tongue, as in the trumpet-honeysuckle, or that the honey contains some noxious ingredient. For this reason it probably is that they pass the open and tempting nectaries of the crown-imperial. Occasionally, however, most likely in seasons of scarcity, their instinct here appears to fail them, for there are instances of whole swarms of bees having been destroyed by feeding on poisonous trees; and it is also probable that bees may sometimes safely partake of honey which is poisonous to man, as was the case with the Greek army, in their celebrated retreat under Xenophon, after the death of the younger Cyrus. Pliny mentions this honey, and observes that it is said to be collected from a kind of *rhododendron,* common on the coast of the Black Sea, where the Greek army met with their misfortune.

That bees, as well as ants, have a *language* intelligible among themselves, I think there is no doubt. As with ants, the antennæ seem to be its chief organs, for they are constantly

seen crossing them with each other when any strange event has happened.

"Huber wished to ascertain whether, when they had lost a queen (intelligence of which traverses a whole hive in about an hour), they discovered the sad event by their smell, their touch, or any unknown cause. He first divided a hive by a grate, which kept the two portions about three or four lines apart, so that they could not come at each other, though scent would pass. In that part in which there was no queen, the bees were soon in great agitation, and as they did not discover her where she was confined, in a short time they begun to construct royal cells, which quieted them. He next separated them by a partition, through which they could pass their antennæ, but not their heads. In this case the bees all remained tranquil, neither intermitting the care of the brood, nor abandoning their other employments, nor did they begin any royal cell. The means they used to assure themselves that their queen was in their vicinity, and to communicate with her, was to pass their antennæ through the openings of the grate." (Kirby and Spence.)

Sometimes other means are taken to call attention, as in the case of a bee coming in laden with pollen, and requiring aid to remove it. She then supports herself on her two fore feet, and by the vibration of her wings and body makes a peculiar sound, which soon summons others to her assistance.

PART IV.

In this concluding paper on bees, it is my intention to say a few words on bee culture. The great advantages in a bee-farm are—(1) that it requires very little outlay at starting; the purchase of a swarm and of a hive to put it in, is all; (2) your labourers work for you without food or wages; (3) they reap their fruits not only from your small garden, but from all the country side, without fear and without reproach.

The wonder is that, under these circumstances, so few people comparatively keep bees; especially wonderful is it that poor people do not commonly keep them, and that those who do, do not keep more of them; for the original small outlay above mentioned is really the whole expense. Nothing need be put by for new hives and stools as the colony increases: the sale of

honey and wax far more than pays for *them*. Room for the new hives, as they increase, is all that is wanted; and no crop that you can plant in the space occupied by a bee-hive will produce a twentieth part of that hive's annual income. Then the bees want very little looking after, and what they want is generally in the middle of the day, and in the evening, when labourers are at home.

Almost the only requisites for an incipient bee-keeper (besides the hive, the swarm, and the bit of garden,) are a little knowledge, which is easily got, and a little calmness and courage in dealing with his industrious but rather irascible friends; whom, however, he will find less irascible, the more intimately he becomes acquainted with them.

The necessary knowledge of the habits and instincts of bees may be gathered from what has already been said. Many people keep bees without knowing half as much about them; but I am no advocate for ignorant management. I hold that you cannot manage any animals properly,—not dogs, nor horses, nor even men,—without a fair ac-

quaintance with their natures, their habits, and their instincts.

But, without further preface, let us proceed at once to the management of bees. There are two systems in vogue in this country, which we might distinguish as (1) robbery *with* murder, and (2) robbery *without*. Robbery, however, if we consider calmly the respective rights of men and bees, is certainly too harsh a name for what is now called the *depriving system;* though murder is not a bit too strong a term for the fire-and-brimstone method hitherto almost universal. There are several advantages in sparing the lives of bees when we take their honey, which is the principle of the depriving system.

(1) The humanity, which is a manifest advantage to ourselves in a moral point of view, as it is to our fellow-creatures the bees physically.

(2) The lives of the bees are valuable to us as productive of honey and wax. The worker-bee lives a year, or at least all the working part of the year; and when bees are slain for their honey, old and young, as well as the immature brood, perish

together; and though in the case of the old bees we may only lose a few days of their labour, in the case of the rest we sacrifice the best part, or even the whole, of their life-labour.

(3) Both the honey and the wax are of better quality, and command a higher price in the market, when obtained by the depriving system than in the common way; because by the latter method (to say nothing of the contamination of the burnt sulphur), the mashing up of bee-bread, and occasionally the young brood with the honey, interferes with its purity and flavour, and the wax of old combs is darker and less pure than that of new.

(4) By the depriving system, after the first and most valuable swarm has left the hive, subsequent swarms, too weak to stand the winter and only exhaustive to the hive, are prevented, and their strength is far more profitably employed in increasing the resources of the mother city. For, as has been before observed, the sole cause of swarms is want of room, and the depriving system provides this by what is called a "super," that is, an additional hive, box, or bell-glass, placed

upon the old hive and communicating with it. This the bees soon take possession of, and in a few days fill with pure white wax and virgin honey for their master, who carefully removes it (sending the bees down below, previous to the operation, with a few puffs from a fumigator), and then replaces it empty for a fresh supply.

I would strongly advise the cottage bee-keeper to try this method. It may be a little more expense at starting, but will soon amply repay him. A hive suited to the purpose may be purchased of the best makers in London (G. Neighbour and Sons, 149, Regent Street) for 10s. 6d., and it might be possible to get one made in the country, not so neat, but equally useful, for less money. The hive I speak of is called in Messrs. Neighbours' list, "The Cottager's Hive." For those who can afford it, and who wish to keep bees for pleasure and instruction as well as for profit, I would recommend "The Woodbury Bar and Frame Hive." By means of this the bee-master can do almost what he likes with his bees,—cause artificial swarms, unite weak stocks, get rid of foul brood, regulate size and shape of combs, catch

the queen when wanted, and a variety of other apiarian feats. The price of this hive complete is £3 10s.

But we English must do everything either in a rude and slovenly, or in an expensive way. They manage these things better in the East. The Rev. H. B. Tristram, in his interesting work, "The Land of Israel," gives the following account of the management of bees in Palestine,—the land that still floweth with honey, if not with milk. After telling us that the Palestine bee is a different species from ours (*Apis ligustica*, while ours is *Apis mellifica*), and that it is distinguished by its brighter golden colour, he says, "The hives are very simple, consisting of large tubes of sun-dried mud, like gas-pipes, about four feet long, and closed with mud at each end, leaving only an aperture in the centre. The tubes are laid in rows horizontally, and piled in a pyramid. I counted one of these colonies, consisting of seventy-eight tubes, each a distinct hive ... *The barbarous practice of destroying the swarms for their honey is unknown.* When the hives are full, the clay is removed from the ends of the pipes, and the honey extracted with an iron hook;

those pieces of comb which contain young bees being carefully replaced, and the hives then closed up again."

How simple, yet all-sufficient for practical purposes, is this plan! The home-made hives cost nothing at all. Then the vast number of hives that can be kept in a small space! It is as if the bee-master had taken the hint of economy of room from the bees themselves, piling up his hives as the bees pile their cells. Then the facility with which the honey is taken, and the bees saved! But here the Easterns are probably favoured by the nature of the species they have to deal with: their bee is said to be less irascible than ours. Certainly he would be a bold man who would hook out his honey from a populous hive of English bees, in the cool way they appear to do.

However, we have now this bee in England, for it is the same as the Ligurian bee which was introduced into this country from the Alps, in 1859, which is becoming so great a favourite with our chief bee-keepers. Its great recommendation, in addition to its better temper, is that the queen is more prolific, and consequently the

honey more abundant, than that of the common bee.

Let us hope that the time may come when every industrious English labourer may possess, besides his pig, a stack of mud hives such as Mr. Tristram describes, tenanted either by Ligurian bees, or by our old kind, persuaded to put up with mud tenements. At present the old prejudice in favour of straw as the only material for hives is too strong to allow of our indulging such a hope. Indeed, it seems questionable if we have not taught our bees to share this prejudice, inconsistent though it is with their traditions of hollow trees.

For my part, I am inclined to think that it matters little of what material a hive is made, if it be properly protected from the weather. In the meantime, and until such prejudices are worn out, a cottager cannot, I think, do better than try the "Cottager's Hive" before mentioned. To a cottager, too poor to set up one for himself, a landlord could not do a greater kindness than by the present of such a hive, with instructions how to manage it. "The Apiary," by Messrs. Neighbour, will supply him with all necessary

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